1998-2005 ENGINE

Complete engine - 163 Chassis

GENERAL INFORMATION

DETERMINE LOSS OF PRESSURE AT CYLINDER - AH01.00-N-1300-02A

All engine

If an increased pressure loss was found with the cylinder leak tightness tester, inspect engine by listening at cylinder head gasket, air intake area, exhaust, oil filler opening and prechamber or spark plug bores of the adjacent cylinder or cylinders.

Check the coolant in the coolant expansion reservoir for the formation of air bubbles.

Possible causes for the pressure loss are:

1. **Outlet of air through prechamber or spark plug bore of adjacent cylinder or cylinders, air bubbles in coolant expansion reservoir:**

   pressure loss at cylinder head gasket

2. **Outlet of air through air intake area:**

   For inspecting by listening, open throttle valve pressure loss at inlet valve(s)

3. **Outlet of air through exhaust:**

   pressure loss at exhaust valve(s)

4. **Outlet of air through oil filler opening:**

   pressure loss through pistons and piston rings

i It is possible to pinpoint the pressure loss of the relevant cylinder by spraying with engine oil. Engine oil seals off the gap between piston and cylinder briefly.

If a reduced pressure loss now occurs for a short time, the cause is very likely to be at the pistons, piston rings or cylinder contact surface of the relevant cylinder.

Determining the cause can be falsified by the position of the piston ring joints. If suspicion exists that the loss of pressure is caused by the piston ring joints being positioned directly one above the other, fit parts to engine and repeat test after running engine for a short time.

GENERAL INFORMATION ON INSPECTING CYLINDER WALLS - AH01.00-P-0300-01A

Engine 112, 113, 122, 134, 135, 137, 166, 275, 285, 611, 612, 613, 628, 629, 639, 642, 646, 647, 648

Pressure gloss marks, smoothings

Individual blank points, e.g. in the middle of the cylinder barrel or around the cylinder head bolts.

[i] The crankcase can be reused.

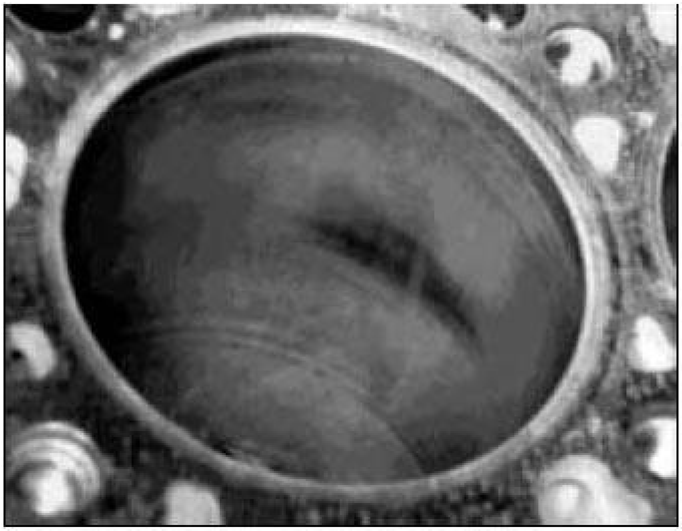


Fig. 1: Identifying Pressure Gloss Marks On Cylinder Walls

Visible mottling, friction marks

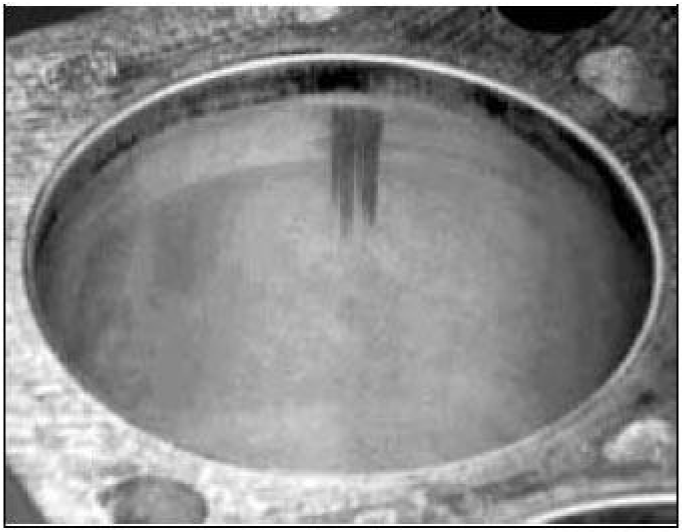
Starting from reverse area of the upper piston ring tapering down.

Traces of dry rubbing which cannot be felt, caused by oil film being washed off by fuel, for example from many cold starts when driving for short distances.

These traces of friction occurring mainly around the cylinder head bolts and on the pressure side are not a problem provided that they are smoothed out.

The piston rings are not damaged.

[i] The crankcase can be reused.



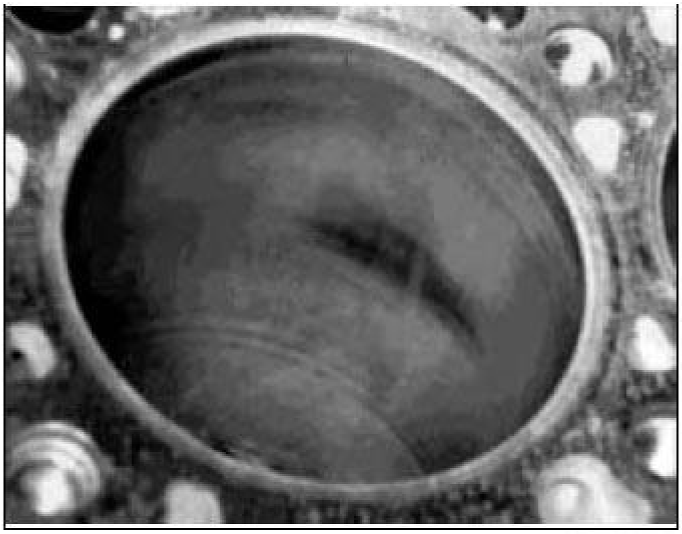
P01.40-0267-11

Fig. 2: Identifying Visible Mottling And Friction Marks On Cylinder Walls

Ring shaped imprints

Visible imprints on cylinder barrel in the upper and lower reverse area of piston rings are not a cause for complaint.

[i] The crankcase can be reused.



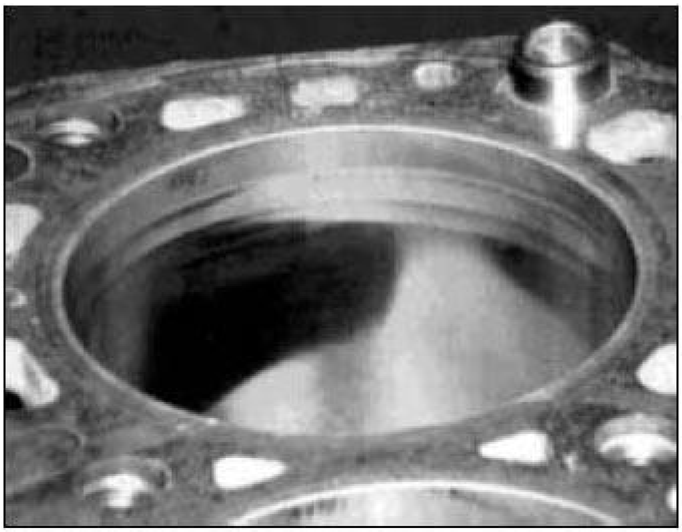
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Fig. 3: Identifying Visible Imprints On Cylinder Barrel

Rotary bright, specular, polished upper surfaces of cylinder

Starting from the reverse area of the upper piston ring with measurable, partial cylinder wear.

[i] The cylinder barrel is unusable.



P01.40-0266-11

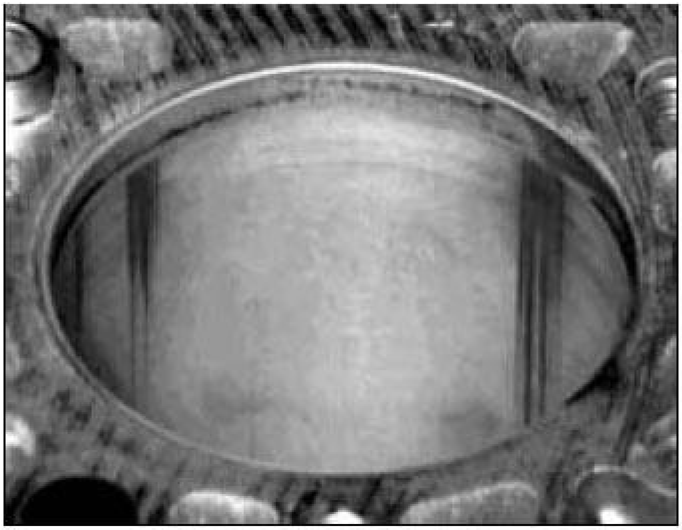
Fig. 4: Identifying Cylinder Wear

Roughened mottling, friction scoring

Starting from first and second piston ring, tapering to an end only in bottom part of cylinder. Progressive signs of friction lead to friction score marks.

Where these signs of friction are perceptible, the cylinder barrel is unusable.

[i] The piston rings may be damaged.



P01.40-0268-11

Fig. 5: Identifying Friction Score Marks

Continuous individual traces of scratch

Caused by dirt, for example, through back pulsation of soot particles from the exhaust.

[i] The crankcase can be reused.

Piston seizure

Most of cylinder wall perceptibly roughened over the entire length.

Material deposits and perceptible scoring marks on cylinder wall and at piston skirt.

[i] The cylinder barrel is unusable.

Brown coloring of cylinder upper surface.

A brown coloration over large areas of the cylinder barrel is oil varnish and indicates that the engine has been driven at a high temperature level.

[i] The crankcase can be reused if no impermissible cylinder warping is visible

Oil varnish above piston ring zone is normal and is not a reason for complaint.

GENERAL NOTES: PASSENGER CARS: COMPLETE ENGINE, CRANKCASE VENTILATION, CYLINDER HEAD, CRANKCASE - AH01.00-Z-9999AZ

MODEL all

	Notes on application of sealant to front cover of cylinder head	ENGINE 629	AH01.30-P-1000-02TJ
	Notes on sealant path for oil pan	ENGINE 642.970 in MODEL 463.303 /340 /341	AH01.45-P-0001-01GY
	Notes on application of sealant to oil pan	ENGINE 629	AH01.45-P-0001-01TJ
[i]	General information on inspecting cylinder walls	ENGINE 272, 273	AH01.00-P-0300-01VA
[i]	Notes on the application of sealant to the cylinder head cover	ENGINE 122.9 in MODEL 454.0	AH01.30-P-1000-08FB
[i]	Notes on application of sealant to oil pan	ENGINE 113, 156...	AH01.45-P-0001-01GZ
[i]	Notes on the application of sealing compound to the cylinder head cover	ENGINE 273	AH01.30-P-1000-08SX
			AH01.45-P-

i	Notes on application of sealant to oil pan	ENGINE 272 in MODEL 164, 251	0001-01GZA
i	General information on inspecting cylinder walls	ENGINE 266.920 /940 /960 /980 in MODEL 169.0/3,245.2	AH01.00-P-0300-01AK
i	General information on inspecting cylinder walls	ENGINE 640	AH01.00-P-0300-01AL
i	Notes on application of sealant to front cover of the cylinder head	ENGINE 272, 273	AH01.30-P-1000-02V
i	Notes on application of sealant to oil pan	ENGINE 134.9, 135.9 in MODEL 454.0	AH01.45-P-0001-01FF
	Information on application of sealant to oil pan	ENGINE 160.921 /922 /923 in MODEL 452.3 /4	AH01.45-P-0001-01RR
i	Notes on application of sealant to oil pan	ENGINE 273	AH01.45-P-0001-01SX
i	General information on inspecting cylinder walls	ENGINE 155	AH01.00-P-0300-01SLR
i	Notes on application of sealant to oil pan	ENGINE 271	AH01.45-P-0001-01T
	Information on application of sealant to oil pan	ENGINE 628.961 in MODEL 211.028	AH01.45-P-0001-01TD
i	General information on inspecting cylinder walls	ENGINE 111, 601, 604, 605, 606, 611,612, 647, 668 ...	AH01.00-N-0300-01A
i	General information on inspecting cylinder walls	ENGINE 112, 113, 122, 134, 135, 137, 166, 275, 285, 611, 612, 613, 628, 629, 639, 642, 646, 647, 648 ...	**AH01.00-P-0300-01A**
i	Information for assigning the cylinder head gaskets	ENGINE 112 ENGINE 113	**AH01.30-P-1000-06V**
i	Information on application of sealant to end cover of crankcase	ENGINE 628 ...	AH01.40-P-1000-04B
i	Information on application of sealant to end cover of crankcase	ENGINE 628 ...	AH01.40-P-1000-04C
i	Notes on application of sealant to oil pan	ENGINE 628.960/962/963	AH01.45-P-0001-01M
i	Notes on application of sealant to oil pan	ENGINE 112...	AH01.45-P-0001-01PV
i	Notes on application of sealant to oil pan	ENGINE 113.963 /967 /968 /987 /988 /989 /990 /991 /992 /995	AH01.45-P-0001-01R
i	Firing order	ENGINE 111 /, 601 /, 602	AH01.00-N-0100-01A

i	Determine loss of pressure at cylinder	ENGINE all	**AH01.00-N-1300-02A**
i	Notes for position of engine number	ENGINE 155	AH01.00-P-0001-01A
i	Notes for position of engine number	ENGINE 166, 266, 640, 668	AH01.00-P-0001-01B
i	Notes for position of engine number	ENGINE 611, 612, 613, 646, 647, 648	AH01.00-P-0001-01C
i	Notes for position of engine number	ENGINE 112, 113, 120, 137, 271, 272, 273, 275, 285, 628, 629, 642	AH01.00-P-0001-01D
i	Notes for position of engine number	ENGINE 601, 602, 603, 604, 605, 606	AH01.00-P-0001-01E
i	Notes for position of engine number	ENGINE 122.9, 134.9, 135.9, 639.9 in MODEL 454.0	AH01.00-P-0001-01FF
i	Notes for position of engine number	ENGINE 160.910, 660.940 in MODEL 450.3 /4	AH01.00-P-0001-01SM
i	General information on inspecting cylinder walls	ENGINE 156	AH01.00-P-0300-01AMG
i	Determining pressure loss of cylinders	ENGINE 640	AH01.00-P-1300-02AL
i	Use of engine no. when installing reconditioned engines and factory-new replacement engines or crankcases	ENGINE all	**AH01.10-P-0001-01A**
i	Use of unleaded fuel in reconditioned engines	ENGINE 102, 110, 115, 116, 117...	AH01.10-P-1000-01A
i	Bolt diagram cylinder head cover	ENGINE 120	AH01.20-P-5014-04AO
i	Notes on application of sealant to cylinder shutoff oil pump	ENGINE 137.970	AH01.30-P-1000-01A
i	Notes on application of sealant to front cover at cylinder head	ENGINE 668.914/940/941 /942	AH01.30-P-1000-02A
i	Notes on application of sealant to front cover of the cylinder head	ENGINE 640 in MODEL 169, 245	AH01.30-P-1000-02AL
i	Notes on application of sealant to front cover at cylinder head	ENGINE 275	AH01.30-P-1000-02C
	Notes on application of sealing compound to front	ENGINE 275	AH01.30-P-

i	cover at cylinder head		1000-02D
i	Notes on application of sealant to rear cover at cylinder head	ENGINE 668.914/940/941 /942	AH01.30-P-1000-03A
i	Notes on application of sealing compound to rear cover at cylinder head	ENGINE 640 in MODEL 169	AH01.30-P-1000-03AL
i	Information on cylinder head contact surface	ENGINE 112 ENGINE 113 ENGINE 112.951 ENGINE 112.976	**AH01.30-P-1000-05A**
i	Information for assigning the cylinder head gaskets	ENGINE 642 in MODEL 164, 203, 209, 251.0 /1 ENGINE 642 in MODEL 463	AH01.30-P-1000-06PI
i	Information for assigning the cylinder head gaskets	ENGINE 642 in MODEL 211	AH01.30-P-1000-06TI
i	Information for assigning cylinder head gaskets	ENGINE 642 in MODEL 219.322, 221	AH01.30-P-1000-06TQ
i	Notes on the application of sealing compound to the cylinder head cover	ENGINE 266.920 /940 /960 in MODEL 169.0 /3, 245.2	AH01.30-P-1000-08AK
i	Notes on the application of sealing compound to the cylinder head cover	ENGINE 266.980 in MODEL 169.0 /3, 245.2	AH01.30-P-1000-08BK
i	Notes on the application of sealing compound to the cylinder head cover	ENGINE 642.970 in MODEL 463.303 /340 /341	AH01.30-P-1000-08GY
i	Notes on the application of sealing compound to the cylinder head cover	ENGINE 642 in MODEL 164, 203, 209, 251.0 /1	AH01.30-P-1000-08PI
i	Notes on the application of sealing compound to the cylinder head cover	ENGINE 642 in MODEL 221	AH01.30-P-1000-08SXI
i	Notes on the application of sealing compound to the cylinder head cover	ENGINE 642 in MODEL 211	AH01.30-P-1000-08TI
i	Notes on the application of sealing compound to the cylinder head cover	ENGINE 642 in MODEL 219.322	AH01.30-P-1000-08TQ
i	Notes on the course of the application of sealing compound on a cylinder head cover	ENGINE 272	AH01.30-P-1000-08V
i	Notes for evaluation of cylinder contact surface	ENGINE 160.9 in MODEL 450.3 /4, 452.3 /4	AH01.40-P-0001-03SM
i	Notes on application of sealant to timing case cover	ENGINE 137.970	AH01.40-P-1000-01A

i	Notes on application of sealant to the timing case cover	ENGINE 266.920 /940 /960 /980 in MODEL 169.0 /3, 245.2	AH01.40-P-1000-01AK
i	Notes on application of sealant to timing case cover	ENGINE 640	AH01.40-P-1000-01AL
i	Notes on application of sealant to timing case cover	ENGINE 156	AH01.40-P-1000-01AMG
i	Information on application of sealant to timing case cover	ENGINE 137.970, 275	AH01.40-P-1000-01C
i	Notes on application of sealant to timing case cover	ENGINE 166.940 /960 /961 /990 /991, 668.914 /940 /941 /942	AH01.40-P-1000-01D
i	Notes on application of sealant to timing case cover	ENGINE 134.9, 135.9 in MODEL 454.0	AH01.40-P-1000-01FF
i	Notes on application of sealing compound to timing case cover	ENGINE 639.939 in MODEL 454.0	AH01.40-P-1000-01FG
i	Notes on application of sealant to timing case cover	ENGINE 642.970 in MODEL 463.303 /340 /341	AH01.40-P-1000-01GY
i	Notes on application of sealant to a timing case cover	ENGINE 642 in MODEL 164, 203, 209, 251.0 /1	AH01.40-P-1000-01PI
i	Notes on application of sealant to timing case cover	ENGINE 642 in MODEL 221	AH01.40-P-1000-01SXI
i	Notes on application of sealant to timing case cover	ENGINE 642 in MODEL 211.020 /022 /084 /089 /220 /222 /284 /289 /620	AH01.40-P-1000-01TI
i	Notes on application of sealant to timing case cover	ENGINE 271	AH01.40-P-1000-01TK
i	Notes on application of sealant to timing case cover	ENGINE 642 in MODEL 219.322	AH01.40-P-1000-01TQ
i	Notes on application of sealant to timing case cover	ENGINE 272, 273	AH01.40-P-1000-01VA
i	Notes on application of sealant to right-hand crankcase	ENGINE 137.970	AH01.40-P-1000-02A
i	Information on application of sealant to crankcase bottom section	ENGINE 137.970, 275, 285	AH01.40-P-1000-03A
i	Information on application of sealant to crankcase bottom section	ENGINE 156.980/982/983	AH01.40-P-1000-03AMG
i	Information on application of sealant to bottom part of crankcase	ENGINE 628 ...	AH01.40-P-1000-03B

i	Information on application of sealant to bottom part of crankcase	ENGINE 629	AH01.40-P-1000-03TJ
i	Information on application of sealant to end cover of crankcase	ENGINE 137.970, 275	AH01.40-P-1000-04A
i	Information on application of sealant to end cover of crankcase	ENGINE 629 at the motor ahead	AH01.40-P-1000-04TJT
i	Notes on application of sealant to crankcase cover	ENGINE 137.970	AH01.40-P-1000-05A
i	Notes application of sealant to end cover with radial shaft seal	ENGINE 112, 113	**AH01.40-P-1000-06A**
i	Notes application of sealant to end cover with radial shaft seal	ENGINE 266, 640 in MODEL 169.0 /3, 245.2	AH01.40-P-1000-06AK
i	Notes on the sealant process for the end cover with radial shaft seal	ENGINE 166.940 /960 /961 /990 /995 /991, 668.914/940/941 /942	AH01.40-P-1000-06C
i	Notes application of sealing compound to end cover with radial shaft seal	ENGINE 134.9, 135.9 in MODEL 454.0	AH01.40-P-1000-06FF
i	Notes concerning application of sealant to an end cover with radial shaft seal	ENGINE 642 in MODEL 203, 209	AH01.40-P-1000-06PI
i	Notes on application of sealant to end cover with radial shaft seal	ENGINE 642 in MODEL 211.020 /022 /084 /089 /220 /222 /284 /289	AH01.40-P-1000-06TI
i	Notes application of sealant to end cover with radial shaft seal	ENGINE 642 in MODEL 219.322	AH01.40-P-1000-06TQ
i	Notes on application of sealant to oil pan	ENGINE 137.970, 275	AH01.45-P-0001-01A
i	Notes on application of sealant to oil pan	ENGINE 266.920 /940 /960 /980 in MODEL 169.0/3,245.2	AH01.45-P-0001-01AK
i	Notes on application of sealant to oil pan	ENGINE 640 in MODEL 169, 245	AH01.45-P-0001-01AL
i	Notes on application of sealant to oil pan	ENGINE 156 ...	AH01.45-P-0001-01AMG
i	Notes on application of sealant oil pan	ENGINE 112.912/946	AH01.45-P-0001-01B
	Notes on application of		**AH01.45-P-**

i	sealant oil pan	ENGINE 112	**0001-01C**
i	Notes on application of sealant oil pan	ENGINE 113.940 /943 /944 /961 /980 /984	AH01.45-P-0001-01D
i	Notes on application of sealing compound to oil pan	ENGINE 113.941 /942 /960 /962 /965 /981 /982 /993	**AH01.45-P-0001-01E**
i	Notes on application of sealant to oil pan	ENGINE 166.940/960/961 /990/991 /995, 668.914/940/941 /942	AH01.45-P-0001-01F
i	Information on application of sealant to oil pan	ENGINE 628.960 /961 /962 /963	AH01.45-P-0001-01MA
i	Notes application of sealant to end cover with radial shaft seal	ENGINE 132.9 in MODEL 451.3/4	AH01.40-P-1000-06MCC
i	Notes on application of sealant to oil pan	ENGINE 122.9 in MODEL 454.0	AH01.45-P-0001-01FB
i	Notes on application of sealant to oil pan	ENGINE 285	AH01.45-P-0001-01H
i	Notes on sealant path for oil pan	ENGINE 132.9 in MODEL 451.3/4	AH01.45-P-0001-01MCC
i	Notes on sealant path for oil pan	ENGINE 642	AH01.45-P-0001-01OM
i	Notes on application of sealant to oil pan	ENGINE 155 in MODEL 199	AH01.45-P-0001-01SLR
i	Notes on application of sealant to oil pan	ENGINE 160,660...	AH01.45-P-0001-01SM
i	Notes on sealant path for oil pan	ENGINE 273	AH01.45-P-0001-01SY
i	Notes on application of sealant to oil pan	ENGINE 272 in MODEL 203.08 /28 /09 /29, 211.08/28/09/29 ENGINE 273 in MODEL 211.09/29	AH01.45-P-0001-01TW
i	Notes on application of sealant to oil pan	ENGINE 272, 273 ...	AH01.45-P-0001-01TZ
i	Notes on application of sealant to oil pan	ENGINE 272	AH01.45-P-0001-01VA
i	Notes on application of sealant to oil pan	ENGINE 272	AH01.45-P-0001-01VB
!	Notes on sealant path for front cover to cylinder head	ENGINE 611, 612, 613, 628, 646, 647, 648 ...	AH01.30-P-1000-02B
!	Notes on application of sealant to cylinder head gasket	ENGINE 113	**AH01.30-P-1000-04V**
!	Notes on application of sealant timing case cover	ENGINE 112, 113	**AH01.40-P-1000-01B**

ⓘ	Notes on application of sealant to the timing case cover	ENGINE 611, 612, 613, 646, 647, 648 ...	AH01.40-P-1000-01E
ⓘ	Information on applying sealant to a cylinder head gasket	ENGINE 112 ENGINE 113 ENGINE 112.951 ENGINE 112.976	**AH01.30-P-1000-04VA**

USE OF ENGINE NO. WHEN INSTALLING RECONDITIONED ENGINES AND FACTORY-NEW REPLACEMENT ENGINES OR CRANKCASES - AH01.10-P-0001-01A

All engines

The engine number has a different legal significance in individual countries. In the Federal Republic of Germany, for example, it has been classified by the legislative authorities since mid-1972 as "insignificant in terms of traffic legislation". It is therefore no longer included in the vehicle title document and vehicle registration document.

Practically all other countries continue to require the indication of the engine number on motor vehicles which are registered in such countries. In dealing with international traffic, the authorities proceed on the basis of the provisions of the country in which the vehicle is registered.

In order to avoid any problems on the occasion of vehicle checks or when crossing international frontiers as a result of the lack of or incorrect engine number, the following directives have to be observed when carrying out repairs.

1. **Directives for vehicles which are registered in the Federal Republic of Germany**
   a. In the case of vehicles for which **no engine number is indicated in the vehicle registration document** (first registration after approx. mid-1972), it is not necessary to stamp or revise an engine number if a replacement engine or crankcase of the same type is fitted.
   b. If an **engine number is indicated in the vehicle registration document** , it is possible, if an engine of the same type is fitted, to transfer the number of the removed component to the new engine, or the appropriate authority (vehicle inspection authority, vehicle registration authority) should be requested to delete the engine number in the vehicle title document or registration document. The German Federal Minister of Transport has issued appropriate ministerial orders in Transport Gazette 1973, p. 66.
2. **Vehicles which are registered outside of the Federal Republic of Germany**

   If a reconditioned engine or factory-new replacement engine or crankcase is fitted and this is of the identical type, it is then necessary to adopt the engine number of the engine removed and to transfer it to the new engine or crankcase.

   NOTE: It is possible in the case of various engines only to stamp the engine number in place when the engine is removed.

   For this reason, pay attention to the particular directives stated in Para 3 for the installation of reconditioned engines, crankcases and shortblocks.

3. **Special directives**

3.1 Installation of factory-new replacement engine of identical type

a. If a factory-new engine is installed and an engine number is required (e.g. vehicle registered outside of the Federal Republic of Germany), the number of the factory-new engine must be ground off and the number of the originally installed engine of identical type stamped in its place.
b. If the factory-new engine is fitted with an engine type plate (older car engines) and it is necessary to indicate an engine number in the vehicle documents, in this case take the engine type plate off the engine removed and affix it at the same point on the engine of identical type to be installed.

3.2 Installation of reconditioned engine of identical type

a. The reconditioned engine plate must not be removed either from the reconditioned engine to be installed, nor from the engine removed, if the latter was a reconditioned engine.
b. If the engine removed is fitted with an engine type plate (older car engines) and it is necessary to indicate an engine number in the vehicle documents, the engine type plate then has to be taken off the engine removed and affixed at the same point to the reconditioned engine to be installed. This plate should be affixed in addition to the reconditioned engine plate.

In the event that a vehicle owner has problems on the occasion of vehicle checks or when crossing international frontiers because of the lack of an engine number, the workshop in question may in certain circumstances be held liable.

After replacing an engine, the engine number has to be altered in the vehicle maintenance booklet and on the vehicle data cards as well as in the repair customer file. These documents should clearly show which engine is installed in the vehicle in order to ensure smooth parts service.

In addition, the copy of the vehicle data card which is held at the Parts Department of the relevant Branch or Importer should also be altered.

3.3 Model designation identification of crankcases and shortblocks

Crankcases and shortblocks available in the parts sector are not provided with an engine model designation identification and also not with an engine number.

To make it possible to identify the engine on the occasion of vehicle inspections (e.g. by an inspection authority when a vehicle is taken out of service or at the Customs on the occasion of importation of vehicle), the workshop carrying out the repairs has to stamp the engine model designation in the crankcase or the shortblock in the space provided for the engine number.

Example:

Type Engine model designation

201.024 102.962

Extract from Transport Gazette 1973 p. 66

(applies only to the Federal Republic of Germany)

Official Gazette of the Federal Minister of Transport

Directive in respect of vehicle title document (VkBl 1972 p. 354)

Bonn, 28 December 1972

StV 2/36.15.17

Pursuant to the directive relating to the vehicle title document dated 20 June 1972, Part C. No. 9.1, a dash should be inserted at the relevant point in the place of data which are no longer required in future (e.g. in the case of the "factory number of engine") in those instances where the older type of title documents are used for the preparation of the vehicle title document.

The question which is now posed is what procedure should be adopted in respect of the vehicle title document or the vehicle registration document in the event that the factory number of the engine from the past is still entered in the older type of title documents and a replacement engine with a new number is now installed in the vehicle in question. Following consultation with the competent authorities in the regions, I now provide the following instructions:

I. In view of the fact that the factory number of the engine is regarded as insignificant in respect of traffic legislation, no change requires to be made to the vehicle documents. This also does not conflict with 27 Para 1 StVZO pursuant to which the data in the vehicle title and registration documents constantly have to reflect actual circumstances. This requirement namely covers only those particulars relating to actual circumstances which are of significance in terms of traffic legislation. This is no longer the case, however, in respect of the factory number of the engine.
II. In order to spare the relevant vehicle owner any misunderstandings or indeed possible disadvantages (e.g. on the occasion of checks when abroad), I recommend proceeding as follows:

In the event that the replacement engine installed has a different number than that entered in the title and registration document, the figures in the column "engine factory number" shall be deleted and the following endorsement made at a suitable point both in the title as well as in the registration document:

"Entry of engine factory number no longer necessary".

If the endorsement is made close to the deletion, it is sufficient to state:

"Entry no longer required".

The Federal Minister of Transport Ip. p.

Wagner

NOTES ON APPLICATION OF SEALANT TO CYLINDER HEAD GASKET - AH01.30-P-1000-04V

Engine 113

Engine 113

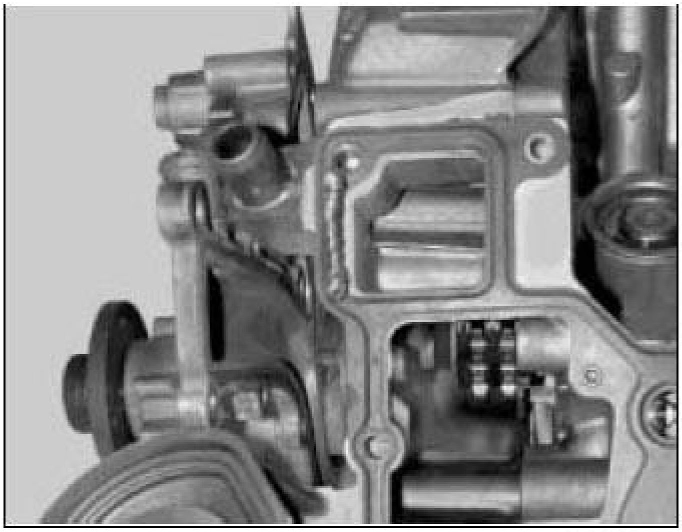
i Before installing the left cylinder head, it is necessary to apply sealant to the cylinder head gasket in the area of the timing case cover because of porous areas in the left cylinder head.

i **Repair note**

The sealant must be applied only in the manner shown, with a bead of 2.0 mm ± 0.5mm.

The sealant must be used within 10 min.

The silicone bead must not be spread.



P01.30-2080-11

Fig. 6: Identifying Application Of Sealant To Cylinder Head Gasket

INFORMATION ON APPLYING SEALANT TO A CYLINDER HEAD GASKET - AH01.30-P-1000-04VA

Engine 112, 113

i If porous points are visible on the cylinder heads or on the rump of the engine in the area of the sealing surface of the cylinder head gasket, apply sealant at these points.

i **Repair information:**

The sealant must only be applied only with a bead of 2.0 mm ± 0.5 mm.

The sealing compound must be applied within 10 min.

The sealing compound bead must not be spread.

INFORMATION ON CYLINDER HEAD CONTACT SURFACE - AH01.30-P-1000-05A

Engine 112, 113

The cylinder head contact surface must only be machined if mechanically damaged points are present.

The cylinder head contact surface must not be re-worked (face-ground) if a variation exists in the flatness of the cylinder head contact surface in the longitudinal direction and transverse direction (distortion).

When the cylinder head is fitted on again, the distortion is compensated for by tightening the cylinder head bolts.

Stock removal on the cylinder head and at the crankcase of an engine must together be not more than 0.3 mm.

The valve seats must be re-set if the cylinder head separating surface is machined.

INFORMATION FOR ASSIGNING THE CYLINDER HEAD GASKETS - AH01.30-P-1000-06V

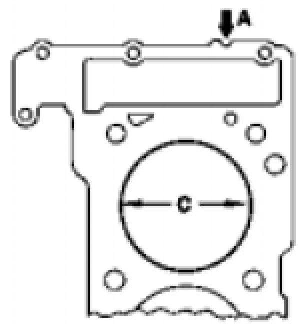
Engines 112, 113

The assignment of the applicable cylinder head gasket on the left and right to the matching engine can be verified when the cylinder heads are installed at the visible round notch between cylinder head and front of crankcase.

[i] Incorrectly installed cylinder head gaskets, e.g. with marking B instead of A, cause a knocking engine noise, particularly at high idling speeds, as the pistons touch the projecting cylinder head gasket. If a complaint exists, replace cylinder head gasket.

Illustration shows M112/113

Motor Baumuster	Hubraum	Zylinderbohrung C in mm	Kennzeichen Rundkerbe	Zylinderkopfdichtung
112.912	2,6	92,00	A 1120160320/0420	
112.913				
112.920	2,8			
112.921				
112.922				
112.923				
112.924				
112.926				
112.926				
112.940	3,2			
112.941				
112.942				
112.943				
112.944				
112.945				
112.946				
112.947				
112.948				
112.949				
112.961				
113.960	5,0	97,00	A 1130100220/0320	
113.961				
113.962				
113.963				
113.980	5,5			
113.981				
113.984				
113.992				



P01.30-2107-06

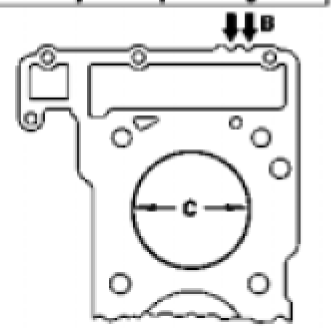
Fig. 7: Information For Assigning Cylinder Head Gaskets (1 Of 2)

The assignment of the applicable cylinder head gasket on the left and right to the matching engine can be verified when the cylinder heads are installed at the visible round notch between cylinder head and front of crankcase.

[i] Incorrectly installed cylinder head gaskets, e.g. with marking B instead of A, cause a knocking engine noise, particularly at high idling speeds, as the pistons touch the projecting cylinder head gasket. If a complaint exists, replace cylinder head gasket.

Illustration shows M112/113

Motor Baumuster	Hub-raum	Zylinderbohrung C in mm	Kennzeichen Rundkerbe	Zylinderkopfdichtung
112.910 112.911	2,4	85,00	B 1120160120/0220	
113.940 113.941 113.942 113.943 113.944 113.945 113.946	4,3	89,90	B 1130160020/0120	



P01.30-2101-05

Fig. 8: Information For Assigning Cylinder Head Gaskets (2 Of 2)

NOTES ON APPLICATION OF SEALANT TIMING CASE COVER - AH01.40-P-1000-01B

Engine 112, 113

Application of sealant to timing case cover

[i] The timing case cover is sealed with a silicone sealant at points **A, C, D.**

(!) No sealant must be applied to the timing case cover at points **B** , pressure oil galleries to crankcase, with the exception around the bolt hole **G** . Sealant which is applied to the points **B** , is entrained by the oil flow and blocks the oil supply drillings of: **Main bearings, camshaft bearings, rocker arms and oil spray nozzles.**

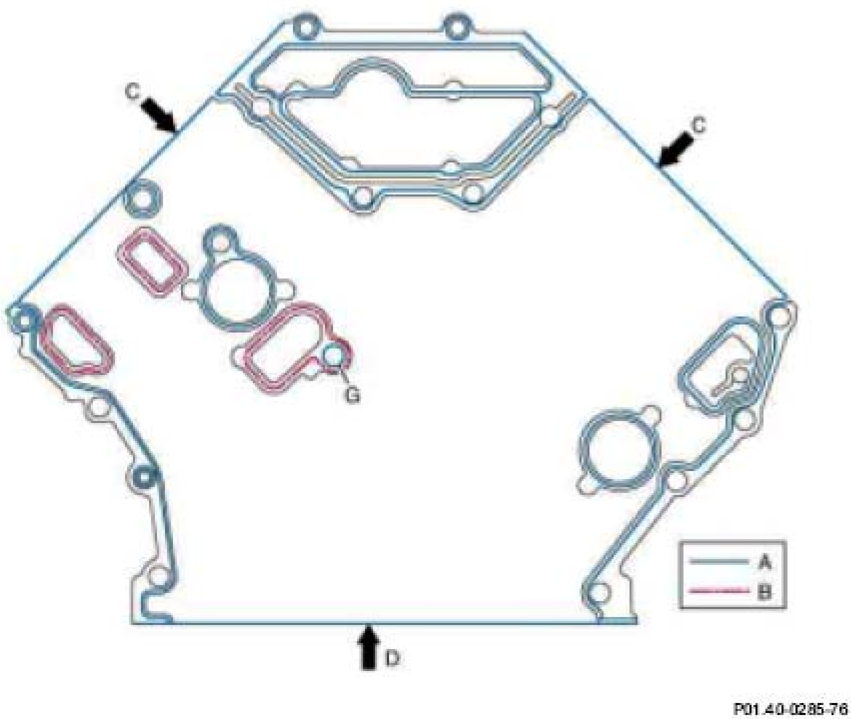


Fig. 9: Identifying Application Of Sealant Timing Case Cover

i **Clean sealing surfaces**

Apply sealant only to the specified surfaces with a bead of 2.0 mm ± 0.5 mm.

The sealant must be applied within 10 minutes!

The silicone bead must not be spread. Only the silicone sealant listed in the section Repair products may be used.

NOTES APPLICATION OF SEALANT TO END COVER WITH RADIAL SHAFT SEAL - AH01.40-P-1000-06A

Engine 112, 113

Application of sealant to end cover

i The lines drawn **G, E** and the arrow **D** mark the application of sealant.

i Clean sealing surfaces, apply sealant only to the specified surfaces with a bead of 2.0 mm ± 0.5 mm.

The sealant must be applied within 10 minutes!

The silicone bead must not be spread. Only the silicone sealant listed in the section Repair products may be used.

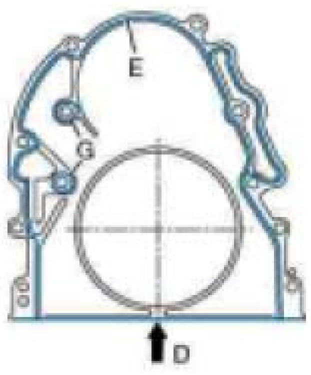


Fig. 10: Identifying Application Of Sealant To End Cover With Radial Shaft Seal

NOTES ON APPLICATION OF SEALANT OIL PAN - AH01.45-P-0001-01C

Engine 112

Application of sealant to top part of oil pan

i The line drawn F marks the application of sealant.

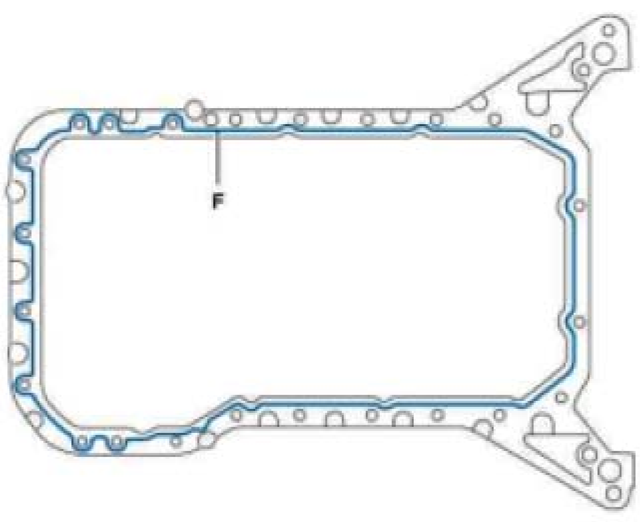


Fig. 11: Identifying Application Of Sealant To Top Part Of Oil Pan - Engine 112

i Clean sealing surfaces, apply sealant only to the specified surfaces with a bead of 2.0 mm ± 0.5 mm.

The sealant must be applied within 10 minutes!

The silicone bead must not be spread. Only the silicone sealant listed in the section Repair products may be used.

Application of sealant to bottom part of oil pan

i The line drawn F marks the application of sealant.

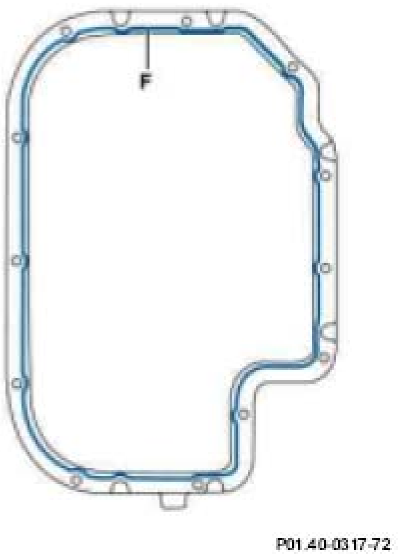


Fig. 12: Identifying Application Of Sealant To Bottom Part Of Oil Pan - Engine 112

i Clean sealing surfaces, apply sealant only to the specified surfaces with a bead of 2.0 mm ± 0.5 mm.

The sealant must be applied within 10 minutes!

The silicone bead must not be spread. Only the silicone sealant listed in the section Repair products may be used.

NOTES ON APPLICATION OF SEALING COMPOUND TO OIL PAN - AH01.45-P-0001-01E

Engines 113.941/942/960/962/965/981/982/993

Application of sealing compound to upper part of oil pan

i The line drawn in (F) identifies the course of the sealing compound.

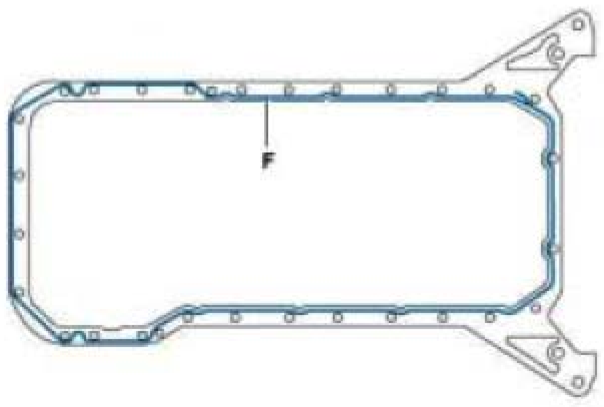


Fig. 13: Identifying Application Of Sealing Compound To Upper Part Of Oil Pan - Engines 113.941/942/960/962/965/981/982/993

i The sealing compound must be only applied to the specified

surfaces in the form of a bead of 2.0 mm ± 0.5 mm in diameter.

The sealing compound must be processed within 10 min. The sealing compound bead must not be spread. Only the sealing compound listed in the section "Repair products" may be used.

Application of sealing compound to bottom part of oil pan

i The line drawn in (F) identifies the course of sealing compound.

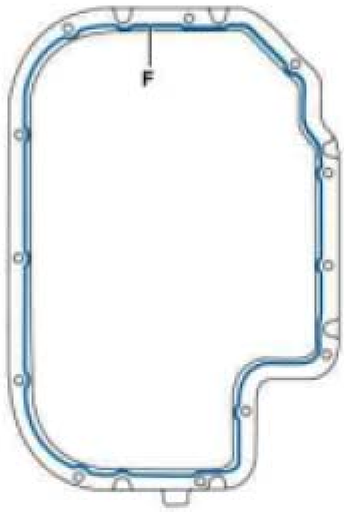


Fig. 14: Identifying Application Of Sealing Compound To Bottom Part Of Oil Pan - Engines 113.941/942/960/962/965/981/982/993

[i] The sealing compound must only be applied to the specified surfaces in the form of a bead of 2.0 mm ± 0.5 mm in diameter.

The sealing compound must be processed within 10 min. The sealing compound bead must not be spread. Only the sealing compound listed in the section Repair products may be used.

TROUBLE DIAGNOSIS

GURGLING NOISE IN HEATER HOUSING - AF01.30-P-1000AG

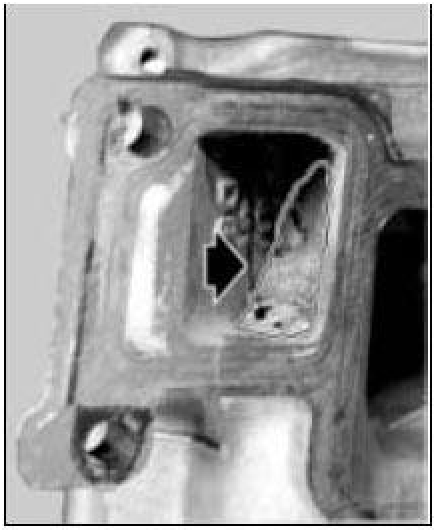
ENGINE 113.##### up to 286599 in MODEL 129, 163, 202, 208, 210, 215, 220

ENGINE 113.### ## up to 286599 in MODEL 463

Modification notes

17.1.01	Replaces STIP 20.10-004 dated 17.01.2001		

Damage code	Cause	Remedy	
01 243 B2	Heater return duct in cylinder head clogged with casting crust	[i] Before working on the cooling system, coolant pump, heater housing, etc.:? 1 Remove left cylinder head	
		ENGINE 113 in MODEL 210, 208, 202, 129	AR01.30-P-5800B
		ENGINE 113 in MODEL 220	AR01.30-P-5800BA
		ENGINE 112.945, 113.962 in MODEL 463	AR01.30-P-5800GV
		ENGINE 113.942 in MODEL 163.172 ENGINE 113.981 in MODEL 163.174	**AR01.30-P-5800MV**
		2 Check coolant duct, if necessary, remove possible casting crust [i] As of engine end number 285600 (as of beginning of 01/2001) there is no casting crust at this point.	



P01.30-2093-02

Fig. 15: Locating Casting Crust In Cooling Duct

COOLANT TEMPERATURE HIGHER THAN NORMAL - AF01.30-P-8000A

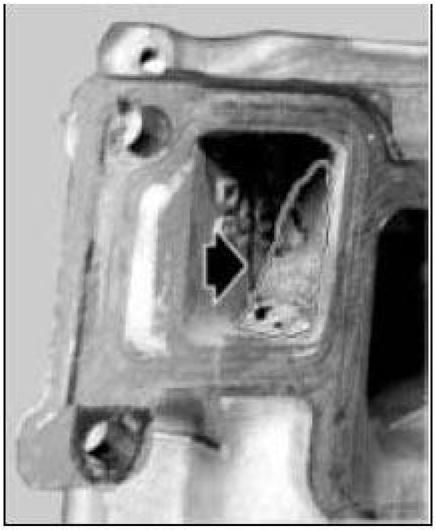
ENGINE 113.##### up to 286599 in MODEL 129, 163, 202, 208, 210, 215, 220

ENGINE 113.### ## up to 286599 in MODEL 463

Modification notes

17.1.01	Supersedes STIP 20.10-004 dated 17.01.2001		

Damage code	**Cause**	**Remedy**	
01 243 B2	Cylinder head with casting crust in coolant duct	[i] Before performing work on cooling system, coolant pump, heater housing, etc.: ? 1. Remove left cylinder head ENGINE 113 in MODEL 210, 208, 202, 129 ENGINE 113 in MODEL 220 ENGINE 112.945, 113.962 in MODEL 463 ENGINE 113.942 in MODEL 163.172 ENGINE 113.981 in MODEL 163.174	AR01.30-P-5800B AR01.30-P-5800BA AR01.30-P-5800GV **AR01.30-P-5800MV**
		2 Check coolant duct, if necessary, remove possible casting crust [i] As of engine end number (as of beginning of 01/2001) there is no casting crust at this point.	



P01.30-2093-02

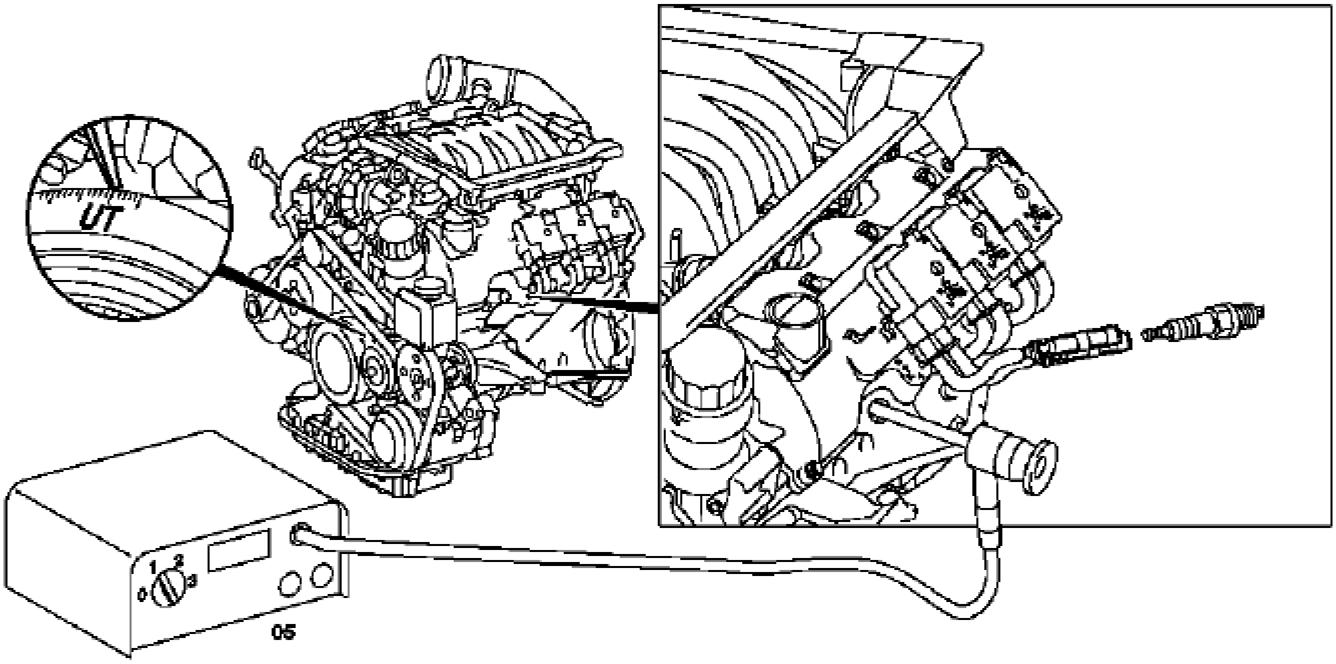
Fig. 16: Locating Casting Crust In Cooling Duct

TESTING & REPAIR

INSPECTING CYLINDERS WITH LIGHT PROBE - AR01.00-P-0200AU

ENGINE 112, 137, 275, 285, 112.945, 113.962/982

ENGINE 113 in MODEL 129, 163, 202, 203, 208, 209, 210, 211, 215, 220, 230



P01.40-0296-09

Fig. 17: Inspecting Cylinders With Light Probe

Shown on engine 112

	Remove/install		
Danger!	**Risk of death** caused by contact with parts conducting high voltages.	Do not touch parts which conduct high voltages. Persons who have electronic implants (e.g. pacemakers) must not perform any work on the ignition system.	**AS15.10-Z-0001-01A**
Danger!	Risk of injury to skin and eyes caused by handling hot or glowing objects.	Wear safety gloves, protective clothing and safety glasses, if necessary.	**AS00.00-Z-0002-01A**
Danger!	**Risk of death** cased by vehicle slipping or toppling off of the lifting platform.	Align vehicle between the columns of the hydraulic hoist and position the four support plates below the hoist support points specified by the vehicle manufacturer.	**AS00.00-Z-0010-01A**
1	Remove a spark plug from each cylinder	Type 208.474 Type 202.088 Model 210.062/262	
AP	Replace spark plugs	Model 129 with engine 112.923/943, 113.961	AP15.10-P-1580AC
		Model 163 with engine 112, 113	**AP15.10-P-1580GH**
		Model 209, 210 except 210.062 /262, 208 except 208.474, 202 except 202.088 with engine 112, 113 Model 203, 170 with engine 112	AP15.10-P-1580A
		Model 215, 220 with engine 137 Model 215, 220, 230 with engine 275 Model 215, 220 with engine 285	AP15.10-P-1580L
		Model 211 with engine 112, 113 Model 215 with Engine 113	AP15.10-P-1580AB

		Model 220 with engine 112, 113 Model 230 with engine 112, 113 Model 240 with engine 285 Model 463 with Engine 112, 113	 AP15.10-P-1580H AP15.10-P-1580GA
2.1	Remove bottom engine compartment paneling	Model 240	AR61.20-P-1105H
3	Position piston of cylinder to be inspected to BDC	To do this, crank the engine at the central bolt of the crankshaft in the direction of rotation of the engine: ? Firing order	**AR01.00-P-1300-03HA**
4	Connect cylinder inspection lamp (05) and insert the flexible test probe for the inspection lamp via the spark plug bore into the respective cylinder	[i] Cylinder inspection equipment [i] Flexible inspection light [i] Flexible inspection light	***WH58.30-Z-1014-05A** ***WH58.30-Z-1006-05A** ***WH58.30-Z-1007-05A**
[check icon]	**Check**		
5	Inspect cylinder walls	[i] Normal condition: Mat-grey surface, no honing pattern. If the condition of the cylinder wall is not clearly recognizable: ? Model 129, 163, 170, 202, 203, 208, 209, 210, 215,220,230,463 Remove cylinder head Model 129 with engine 112, 113 Model 202, 208, 210 with engine 113 Model 163 with engine 112, 113 Model 170, 202, 208, 210 with engine 112 Model 220 with engine 112, 113 Model 230 with engine	 AR01.30-P-5800B **AR01.30-P-5800MV** AR01.30-P-5800BA

		113	
		Model 203 with engine 112, 113 except 203.764	AR01.30-P-5800PV
		Model 209 with engine 112, 113	
		Type 203.764	AR01.30-P-5800L
		Model 215, 220 with engine 137	
		Model 215, 220 with engines 275.950/ 980	AR01.30-P-5800M
		Model 230 with engine 275.951	
		Model 463 with Engine 112, 113	AR01.30-P-5800GV
		Model 240	AR01.10-P-2400H
		Remove engine	
	General information on inspecting cylinder walls	Engine 112, 113, 134, 135, 137, 166, 275, 285, 611, 612, 613, 628, 639, 646, 647, 648	**AH01.00-P-0300-01A**
6	Inspect the remaining cylinders following the same procedure		
7	Install in the reverse order		

Commercially available tools

Number	Designation
WH58.30-Z-1006-05A	Flexible endoscope, package contents 1 (complete unit), Firma Richard Wolf GmbH D-75438 Knittlingen Firma Karl Storz GmbH D-78532 Tuttlingen
WH58.30-Z-1007-05A	Flexible endoscope package contents 2 (for workshops which already have an approved endoscope from the Wolf or Storz company), Firma Richard Wolf GmbH D-75438 Knittlingen Firma Karl Storz GmbH D-78532 Tuttlingen
WH58.30-Z-1014-05A	Cylinder inspection equipment

TESTING COMPRESSION PRESSURE - AR01.00-P-1200B

ENGINE 112

Air filter positioned at vehicle side.

ENGINE 113

Air filter positioned at vehicle side.

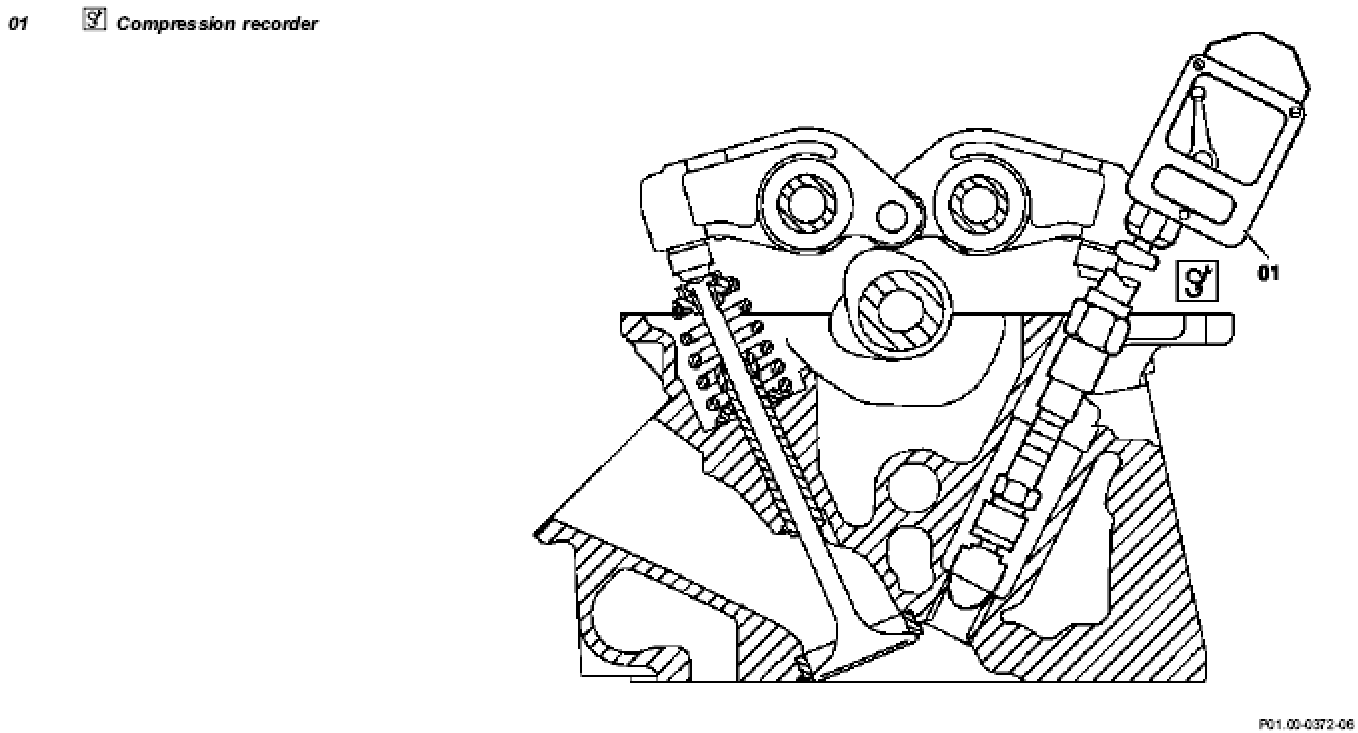


Fig. 18: Identifying Compression Recorder Assembly

	Remove/install		
Danger!	**Risk of accident** caused by vehicle starting off by itself when engine is running. **Risk of** injury caused by contusions and burns during starting procedure or when working near the running engine	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes. Do not grasp hot or rotating parts.	**AS00.00-Z-0005-01A**
1	Bring engine to operating temperature (approx. 80° C)	i Only test compression when engine is at operating temperature.	
2	Remove engine trim panel		
3	Remove air filter housing		
4	Remove resonance pipe with resonance body	i All except model 163 with engine 113.942/981. ○ Disconnect plug	**AR07.07-P-1454A**

		connection for hot film mass air flow sensor (HFM-SFI) for this step and ◦ unbolt resonance pipe at cylinder head cover. [i] The resonance pipe is attached to the rear of the intake manifold with a plastic bracket. (!) Do not damage plastic plate.	
5 AP AP	Remove spark plugs	Remove only one spark plug at each cylinder: ? Models 210, 208, 202 with engine 112 Model 210 with engine 113 Model 163 with engines 112, 113	 AP15.10-P-1580A **AP15.10-P-1580GH**
6 [✓]	Crank engine with starter. **Checking**	(!) Do not crank engine at steering lock but use contact switch of the compression recorder. [i] Crank engine several times with the starter in order to eliminate combustion residues in the cylinder.	**AR01.10-P-0110V**
7	Insert compression tester into spark plug bore	[⤢]	**Fig. 21**
8	Open throttle valve		
9	Crank engine with starter	(!) Do not crank engine at steering lock but use contact switch of the compression recorder. [i] To check the compression pressure, crank the engine by at	**AR01.10-P-0110V**

		least 8 revolutions.	
10	Carry out test procedure at the remaining cylinders in the same way		
11	Compare measurements obtained with the specified pressures	If necessary, if the pressure is below the minimum compression pressure or if permissible difference between individual cylinders is exceeded:? Inspect cylinders for leaks	***BE01.00-P-1001-01D** ***BE01.00-P-1002-01D** ***BE01.00-P-1003-01D** **AR01.00-P-1300HV**
12	Install in the reverse order		

Compression pressure

Number	Designation		Engines 112.910/ 911/912/920/921/923/940/941/ 942/943/960, 113.940/942/ 943/961/963 low compression	Engines 112.910/ 911/920/921/ 922/923/940/ 941/942/943/ 944/945/946/947, 113.940/941/942/ 943/960/961/962/ 963/965/968/969 normal compression	Engine 113.944 Standard compression
BE01.00-P-1001-01D	Compression installation tolerance or new value	bar	10...12	12 to 14	11 to 13
BE01.00-P-1002-01D	Compression pressure wear limit or limit value	bar	8.0	9.0	10.0
BE01.00-P-1003-01D	Compression pressure permissible difference between individual cylinders	bar	1.5	1.5	1.5

Compression pressure

Number	Designation		Engines 113.980/ 981/982/984 Standard compression	Engine 113.992/995	Engine 113.992/995 990/991/993
BE01.00-P-1001-01D	Compression installation tolerance or new value	bar	11 to 13	11 to 13	9 to 12
BE01.00-P-1002-01D	Compression pressure wear limit or limit value	bar	10.0	8.0	8.0
BE01.00-P-1003-01D	Compression pressure permissible difference between individual cylinders	bar	1.5	1.5	1.5



Fig. 19: Identifying Compression Recorder (001 589 76 21 00)

TESTING COMPRESSION PRESSURE - AR01.00-P-1200V

ENGINE 112

Air filter motor page arranged

ENGINE 113 (except 113.995) in MODEL 129, 163, 202, 203, 208, 209, 210, 211, 215, 220, 230 Air filter motor page arranged

ENGINE 112.945 in MODEL 463.209 /232 /233 /244 /245 /250

ENGINE 113.962 in MODEL 463.206 /240 /241 /247 /248 /249 /254

ENGINE 113.982 in MODEL 463.243

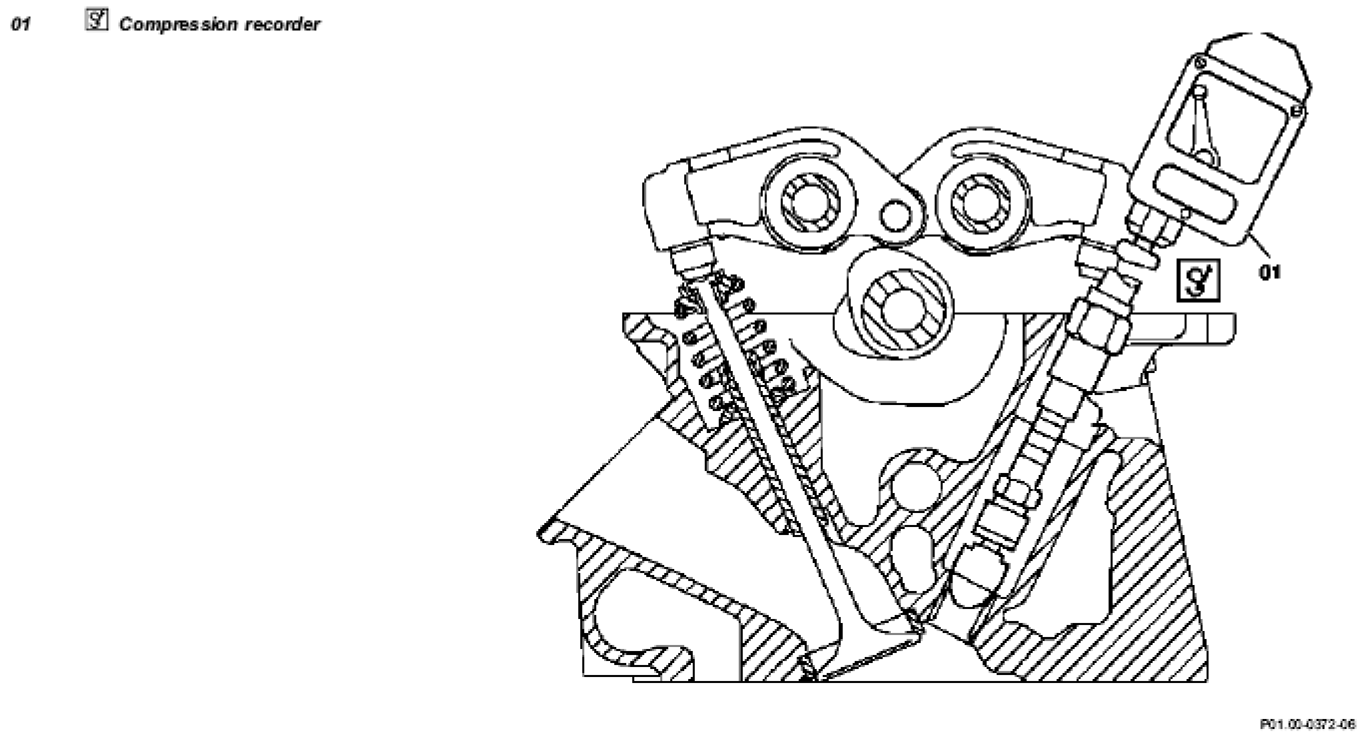


Fig. 20: Identifying Compression Recorder Assembly

	Remove/install		
Danger!	**Risk of accident** caused by vehicle starting off by itself when engine is running. **Risk of injury** caused by contusions and burns during starting procedure or when working near the running engine	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes. Do not grasp hot or rotating parts.	**AS00.00-Z-0005-01A**
1	Bring engine to operating temperature (approx. 80°C)	i Test compression pressure only when engine is at normal operating temperature.	
2	Remove air filter housing	All except model 203.065/265, 170.466: ? i Detach the air filter housing from the rubber retainers at the cylinder head covers vertically upward. i Models 211, 220, 230.475: Unclip engine front end cover. i **Installation:** Rub the retaining rubbers on the cylinder head	

		covers and sealing ring of the hot film air mass sensor in the air filter housing with lubricant. Models 230.474, 203.065/265, 170.466 Lubricant	AR09.10-P-1150SVK ***BR00.45-Z-1002-06A**
3 AP AP AP	Remove spark plugs	Remove only one spark plug per cylinder: ? Models 463.209 /232 /233 /244 /245 /250 with engine 112.945. Models 463.206 /240 /241 /247 /248 / 249 /254 with Engine 113.962. Models 463.243 /246 with Engine 113.982 Models 211, 220, 230.474/475 Models 210, 208, 203, 202, 170, 129	AP15.10-P-1580GA AP15.10-P-1580AB AP15.10-P-1580A
4.1	Remove key from electronic ignition switch (EIS)	Models 211,230.474/475 Vehicles with code (889) Keyless Go: Press the start/stop button repeatedly until the ignition is switched off.	
5	Crank engine with starter.	Do not crank engine at steering lock but use contact switch of the compression recorder. In order to remove the combustion residue from the cylinders, crank the engine for about 5 seconds with the starter. All except model 203 Model 203	**AR01.10-P-0110V** AR01.10-P-0110PV
	Checking		
6	Insert compression tester into spark plug bore	Compression recorder	**Fig. 21**
7	Open throttle valve	Except models 211, 230.474/475	
8	Crank engine with starter.	Do not crank engine at steering lock but use contact switch of the compression recorder. All except model 203 Model 203	**AR01.10-P-0110V** AR01.10-P-0110PV

9	Carry out test procedure at the remaining cylinders in the same way		
10	Compare measurements obtained with the specified pressures	Compression installation tolerance or new value Compression pressure wear limit or limit value Compression pressure permissible difference between individual cylinders If the pressure is below the minimum compression pressure or if the permissible difference between individual cylinders is exceeded: ? Inspect cylinders for leaks	***BE01.00-P-1001-01D** ***BE01.00-P-1002-01D** ***BE01.00-P-1003-01D** **AR01.00-P-1300HV**
11	Install in the reverse order		

Compression pressure

Number	Designation		Engines 112.910/ 911/912/920/921/923/940/941/ 942/943/960, 113.940/942/ 943/961/963 low compression	Engines 112.910/ 911/920/921/ 922/923/940/ 941/942/943/ 944/945/946/947, 113.940/941/942/ 943/960/961/962/ 963/965/968/969 normal compression	Engine 113.944 Standard compression
BE01.00-P-1001-01D	Compression installation tolerance or new value	bar	10...12	12 to 14	11 to 13
BE01.00-P-1002-01D	Compression pressure wear limit or limit value	bar	8.0	9.0	10.0
BE01.00-P-1003-01D	Compression pressure permissible difference between individual cylinders	bar	1.5	1.5	1.5

Compression pressure

Number	Designation		Engines 113.980/ 981/982/984 standard compression	Engine 113.987/988/ 990/991/993	Engine 113.992/995
BE01.00-P-1001-01D	Compression installation tolerance or new value	bar	11 to 13	9 to 12	11 to 13
BE01.00-P-1002-01D	Compression pressure wear limit or limit value	bar	10.0	8.0	8.0
BE01.00-P-1003-01D	Compression pressure permissible difference between individual cylinders	bar	1.5	1.5	1.5



Fig. 21: Identifying Compression Recorder (001 589 76 21 00)

Repair materials

Number	Designation	Order number
BR00.45-Z-1002-06A	Lubricant	A 000 989 01 60

FIRING ORDER - AR01.00-P-1300-03HA

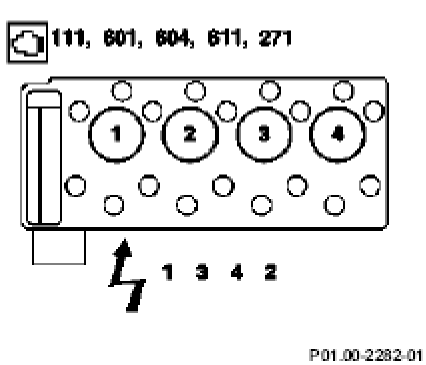


Fig. 22: Identifying Firing Order (Engines 111, 601, 604, 611, 271)

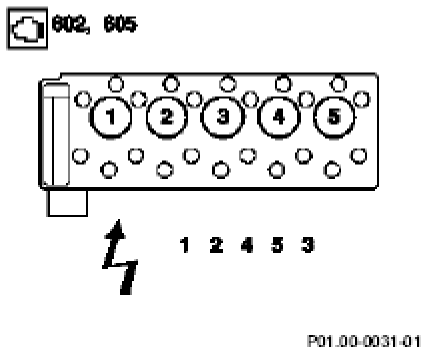


Fig. 23: Identifying Firing Order (Engines 602, 605)

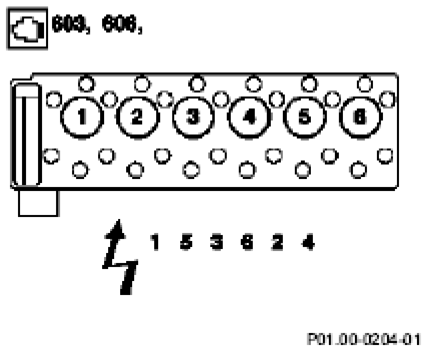


Fig. 24: Identifying Firing Order (Engines 603, 606)

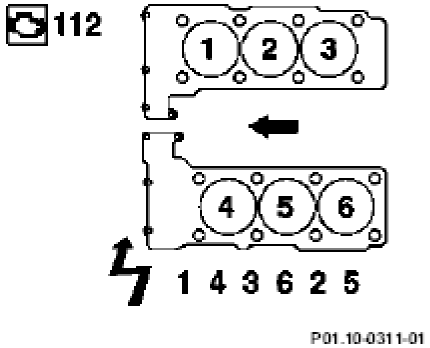


Fig. 25: Identifying Firing Order (Engine 112)

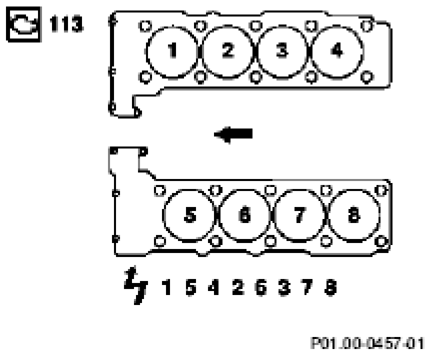


Fig. 26: Identifying Firing Order (Engine 113)

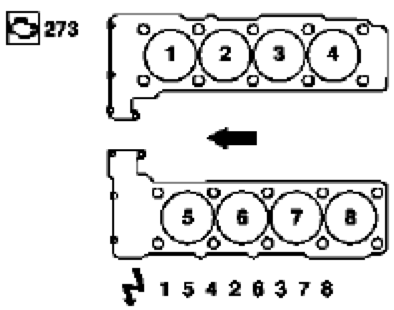


Fig. 27: Identifying Firing Order (Engine 273)

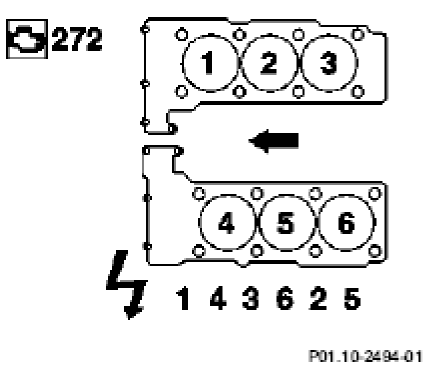


Fig. 28: Identifying Firing Order (Engine 272)

ENGINES 137,275,285

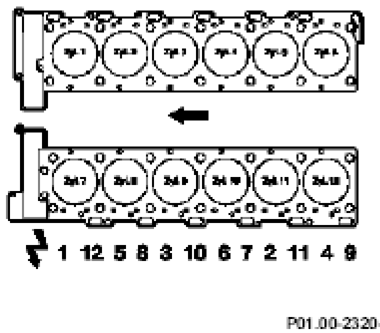


Fig. 29: Identifying Firing Order (Engines 137,275,285)

INSPECT CYLINDERS FOR LEAKS - AR01.00-P-1300HV

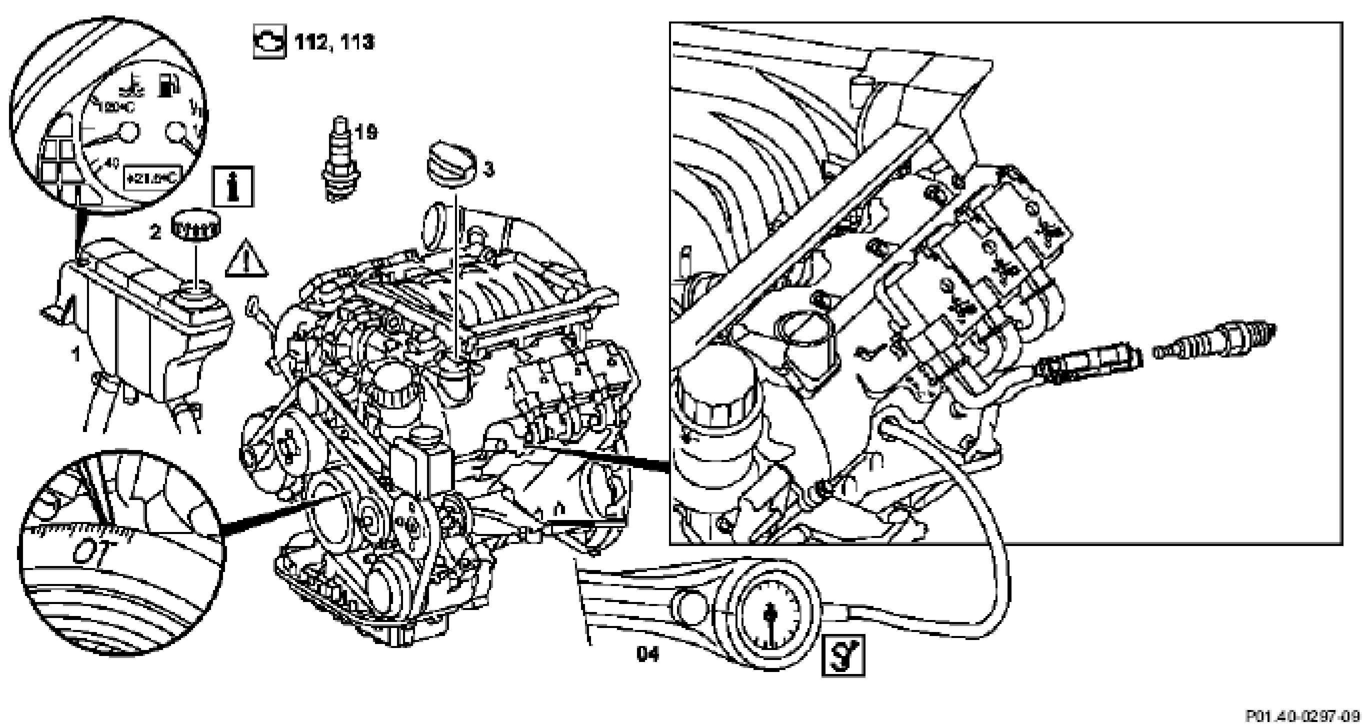
ENGINE 112,137,285

ENGINE 112.945 in MODEL 463.209 /232 /233 /244 /245 /250

ENGINE 113.962 in MODEL 463.206 /240 /241 /247 /248 /249 /254

ENGINE 113.982 in MODEL 463.243/246

ENGINE 113 (except 113.995) in MODEL 129, 163, 202, 203, 208, 209, 210, 211, 215, 220, 230



		3	*Oil filler cap*
1	*Expansion reservoir*	*19*	*Spark plug*
2	*End cover*	*04*	*Cylinder leakage tester*

Fig. 30: Identifying Components For Inspecting Cylinders For Leaks

Shown on Engine 112

	Remove, Install		
Danger! 1	**Risk of accident** from vehicle starting off by itself when engine running. **Risk of injury** suffered in the form of bruises or burns to the hands when reaching in while the engine cranks or runs Bring engine to operating temperature (approx. 80 °C)	Secure vehicle to prevent it from moving off by itself. Wear closed and close-fitting work clothes. Do not grasp hot or rotating parts. i Check the cylinder for leaks only when the engine is at normal operating temperature.	**AS00.00-Z-0005-01A**
Danger! 2	**Risk of injury** to skin and eyes suffering scalding from contact with hot coolant spray. **Risk of poisoning** from swallowing coolant. Open cap (2) of expansion reservoir	Do not open cooling system unless coolant temperature is below 90 °C. Open cap slowly and release the pressure. Do not pour coolant into beverage bottles. Wear protective gloves, protective clothing and eye protection. In Model 463 with Engine 112, 113, a cap (2) with a detent is built-in i Turn cap carefully up to the first pre-detent, relieve the pressure and then unscrew the cap (2). i A 1-stage cap is fitted to Model 163 with Engine 112, 113. i Turn the 1-stage and 2-stage cap half a revolution counterclockwise, relieve the pressure, then unscrew the 1-stage or 2-stage cover.	**AS20.00-Z-0001-01A**
3 AP	Remove a spark plug (19) from each cylinder	Model 202, 208, 209, 210 with Engine 112, 113.	AP15.10-P-1580A

		Model 203, 170 with Engine 112.	
AP		Model 163 with Engine 112, 113.	**AP15.10-P-1580GH**
AP		Model 215, 220 with Engine 137.	AP15.10-P-1580L
AP		Model 230.474/475, 211, 220 with Engine 112, 113	AP15.10-P-1580AB
AP		Model 240 with Engine 285.	AP15.10-P-1580H
AP		Model 463 with Engine 112,113	AP15.10-P-1580GA
4	Position piston of cylinder to be tested to ignition TDC	i Crank the engine at the center bolt of the crankshaft in the direction of rotation of engine.	
5	Connect cylinder leak tester (04)	i Calibrate cylinder leakage tester (04) and screw the connection hose into the spark plug bore i Cylinder leak tester	***WH58.30-Z-1015-05A**
6	Remove the oil filler cap (3)		
	Inspection		
7	Apply compressed air to the cylinder, read off pressure loss on the cylinder leakage tester (04) and determine the cause if there is an increased pressure loss	Cylinder leaktightness permissible loss total indication	***BE01.00-P-1001-02Z**
		Cylinder leaktightness permissible losses at valves and cylinder head gasket	***BE01.00-P-1002-02Z**
		Cylinder leaktightness permissible losses at pistons and piston rings	***BE01.00-P-1003-02Z**
		If the crankshaft rotates: ?	
		Engine 112, 113, 137. Install retaining lock for crankshaft	**AR03.30-P-5000B**
		Engine 285. Lock crankshaft with counterholder. Retainer	**Fig. 31**
8	Conduct the test of the other cylinders in the firing order of the engine		**AR01.00-P-1300-03HA**
9	Install in the reverse		

	order		

Cylinder leakage

Number	Designation		All Engines
BE01.00-P-1001-02Z	Cylinder leakage permissible loss total indication	%	< or = 25
BE01.00-P-1002-02Z	Cylinder leakage permissible losses at valves and cylinder head gasket	%	< or = 10
BE01.00-P-1003-02Z	Cylinder leakage permissible losses at pistons and piston rings	%	< or = 20

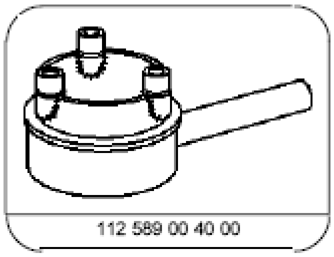


Fig. 31: Identifying Counterholder (112 589 00 40 00)

Commercially available tools

Number	Designation
WH58.30-Z-1015-05A	Cylinder leakage testing unit

DISCONNECTING AND CONNECTING ENGINE WIRING HARNESS - AR01.00-P-2410V

ENGINE 112.942 in MODEL 163.154

ENGINE 112.970 in MODEL 163.157

ENGINE 113.942 in MODEL 163.172

ENGINE 113.981 in MODEL 163.174

ENGINE 113.965 in MODEL 163.175

Shown on Model 163.154

1	Cover of fuse module
2	Cover of relay module
3	Bracket
4	Positive lead
5	Electrical line
W10	Battery ground
W16/6	Electronics ground of right major assemblies compartment

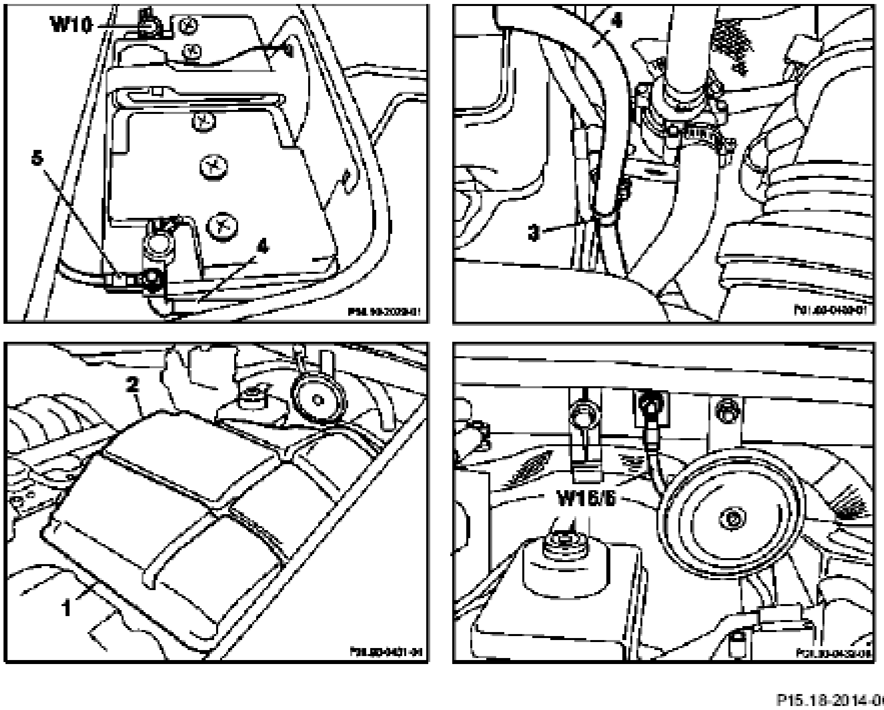
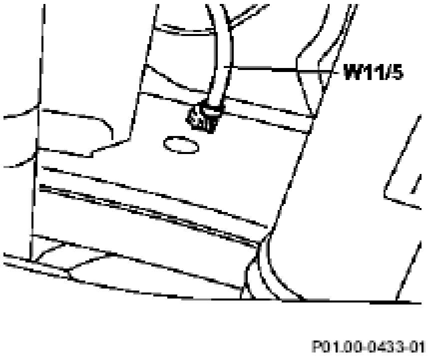


Fig. 32: Identifying Engine Wiring Harness - Shown On Model 163.154



W11/5	Ground strap of engine/body

Fig. 33: Identifying Ground Strap Of Engine/Body - Shown On Model 163.154

Shown on Model 163.154

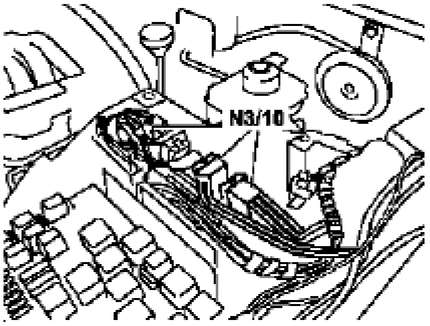


Fig. 34: Identifying Motor Electronics Control Module - Shown On Model 163.154

Shown on Model 163.154

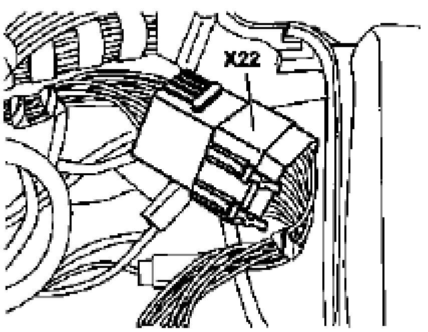


Fig. 35: Identifying Connector Of Engine Compartment And Engine - Shown On Model 163.154

Shown on Model 163.154

	Remove/Install		
1	Disconnect ground of battery (W10)	**Installation:** After connecting, read out fault memory, encode radio and normalize power windows. Vehicles with stationary heater: adjust time display on stationary heater.	**AR54.10-P-0003A**
2	Remove cover of fuse module (1)		
3	Remove cover of relay module (2)		
	Remove electronics ground of		

4	right major assemblies compartment (W16/6) of engine wiring harness		
5	Remove electrical line (5) at positive lead (4)		
6	Disconnect positive cable (4) at battery		
7	Take off bracket (3) of positive cable (4)	[i] Bracket next to coolant circulation pump.	
8	Separate connector of engine compartment and engine (X22) in fuse and relay module		
9	Separate connectors of motor electronics control module (n3/10)	[i] Release locking arm, separate plug connection	
10	Unscrew ground strap of engine/body (W11/5) to vehicle frame		
11	Install in the reverse order		
12	Read out and erase diagnostic trouble code memory with HHT or STAR DIAGNOSIS	[i] After completion of the work, it is necessary to process and erase the DTCs stored in the DTC memory during assembly and testing work due to disconnected lines and simulation. Diagnosis Manual Volume 2 Index 0: Connecting and using test equipment	

CONNECT COMPRESSION TESTER INFORMATION ON PREVENTING DAMAGE TO ELECTRONIC COMPONENTS DUE TO ELECTROSTATIC DISCHARGE - AR01.10-P-0010-01V



Fig. 36: Identifying Compression Recorder (001 589 76 21 00)



Fig. 37: Identifying Electrical Connection Set (201 589 00 99 00)

1. Remove cover on fuse and relay module.
2. Clip connection terminal (A) of compression tester onto circuit 30, 15, 61 terminal block (3-pin) (X12/3).
3. Pull starter relay (2) out of the fuse module (relay place 8).
4. Connect adapter line (1)with terminal 87 in relay place 8 of the fuse module.
5. Connect adapter line (1) to the cable of the compression tester.

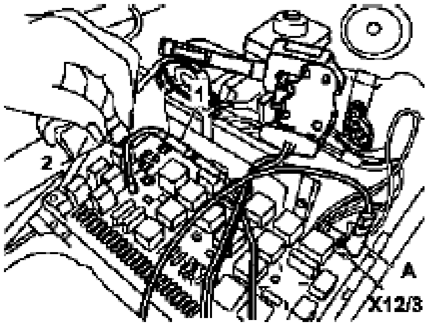


Fig. 38: Identifying Starter Relay & Fuse Module

CRANKING ENGINE WITH STARTER. - AR01.10-P-0110V

ENGINE 112 in MODELS 129, 163, 170, 202, 208, 210, 211, 220, 230

ENGINE 113 in MODELS 129, 163, 202, 208, 210, 211, 215, 220, 230

ENGINE 112.945 in MODELS 463.209 /232 /233 /244 /245 /250

ENGINE 137 in MODELS 215, 220

ENGINE 285 in MODEL 240

ENGINE 113.962 in MODELS 463.206 /240 /241 /247 /248 /249 /254

ENGINE 113.982 in MODELS 463.243 /246

ENGINE 275 in MODELS 215, 220, 230

Shows model 202

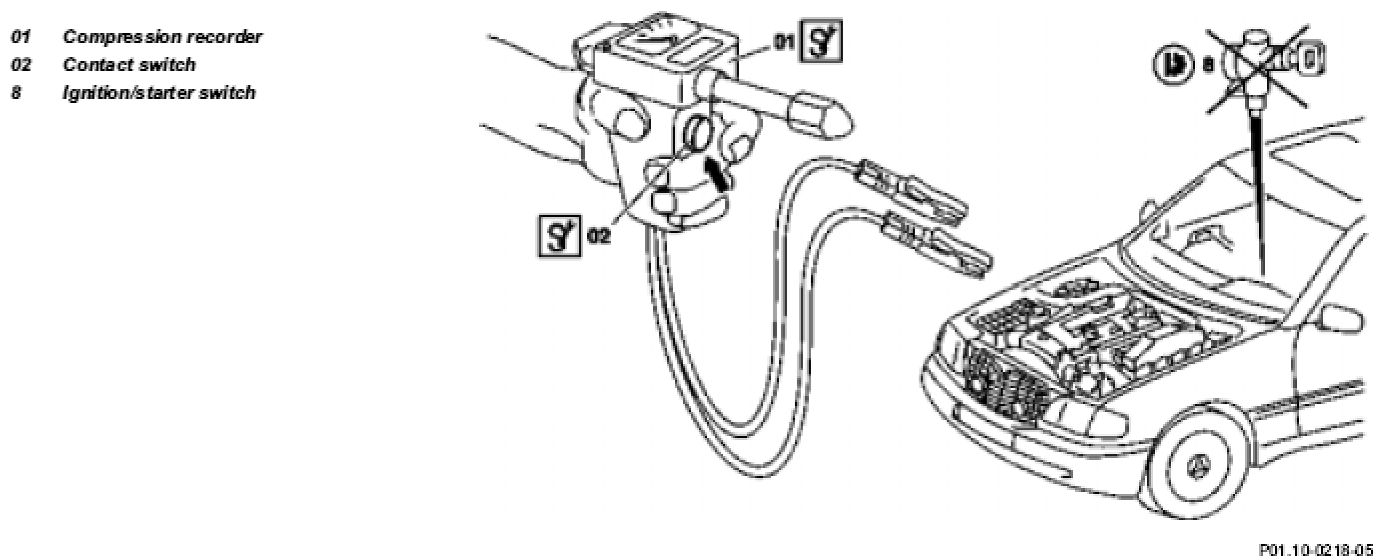


Fig. 39: Identifying Cranking Engine With Starter - Shows Model 202

	Remove/install		
Danger!	**Risk of accident** caused by vehicle starting off by itself when engine is running. **Risk of injury** caused by contusions and burns during starting procedure or when working near the running engine	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes. Do not grasp hot or rotating parts.	**AS00.00-Z-0005-01A**
1	Switch off ignition	i Vehicles with Keyless-Go Code 889: press Start/Stop button repeatedly until ignition is switched off.	
		Model 129 Model 163.1 Model 170 Model 210 with engine 112 up to production date 1.3.1997 Model 210 with engine 112 from production date 2.3.1997, Models 202, 208 with engine 112, Models 210, 202, 208 with engine	AR01.10-P-0010-01AV **AR01.10-P-0010-01V** AR01.10-P-0010-01CA AR01.10-P-0010-01B AR01.10-P-0010-01E

2	Connect compression recorder (01)	113 Model 211 Model 215, model 220 Model 230 Model 240 Model 463.2 Compression recorder Electrical connection set Adapter cable	 AR01.10-P-0010-01T AR01.10-P-0010-01L AR01.10-P-0010-01R AR01.10-P-0010-01H AR01.10-P-0010-01GV **Fig. 21** **Fig. 40** **Fig. 42**
3	Crank engine	Press contact switch (02) on compression recorder (01) for this step. Do not crank engine via ignition/starter switch (8), EIS [EZS] control unit or Start-Stop button.	
4	Install in the reverse order		
5	Read out fault memory and erase if necessary	If the ignition was switched on during the process: ? Stored faults which may be caused by removal and installation or test operations, must be erased from the diagnostic trouble code memories after completing the work. STAR DIAGNOSIS diagnosis system Handheld tester (HHT)	***WH58.30-Z-1048-13A** ***WH58.30-Z-1036-13A**

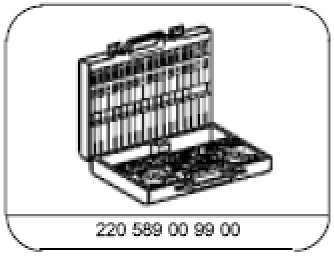


Fig. 40: Identifying Electrical Connection Kit (220 589 00 99 00)

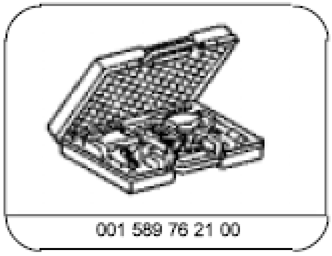


Fig. 41: Identifying Compression Recorder (001 589 76 21 00)

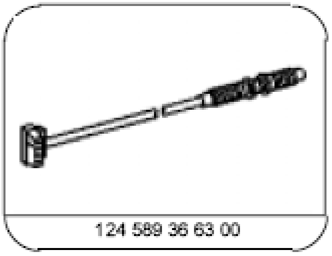


Fig. 42: Identifying Adapter Cable (124 589 36 63 00)

Commercially available tools

Number	Designation	
WH58.30-Z-1036-13A	Handheld tester (HHT)	651 100 01 99
WH58.30-Z-1048-13A	STAR DIAGNOSIS diagnosis system, Compact Passenger Car	6511 1801 00

REMOVE/INSTALL ENGINE - AR01.10-P-2400CA

ENGINE 112.942 in MODEL 163.154

ENGINE 112.970 in MODEL 163.157

ENGINE 113.942 in MODEL 163.172

ENGINE 113.981 in MODEL 163.174

ENGINE 113.965 in MODEL 163.175

Illustrated on model 112.942

1	*Viscous fan*
2	*Fan shroud*
3	*Poly-V-belt*
4	*Fuel pipe*
5	*Brake booster vacuum line*
6	*Regeneration vacuum line*
7	*Air filter housing*
8	*Resonance tube*
9	*Resonance unit*
23	*Air baffle*
24	*Left fender liner*
25	*Shield*

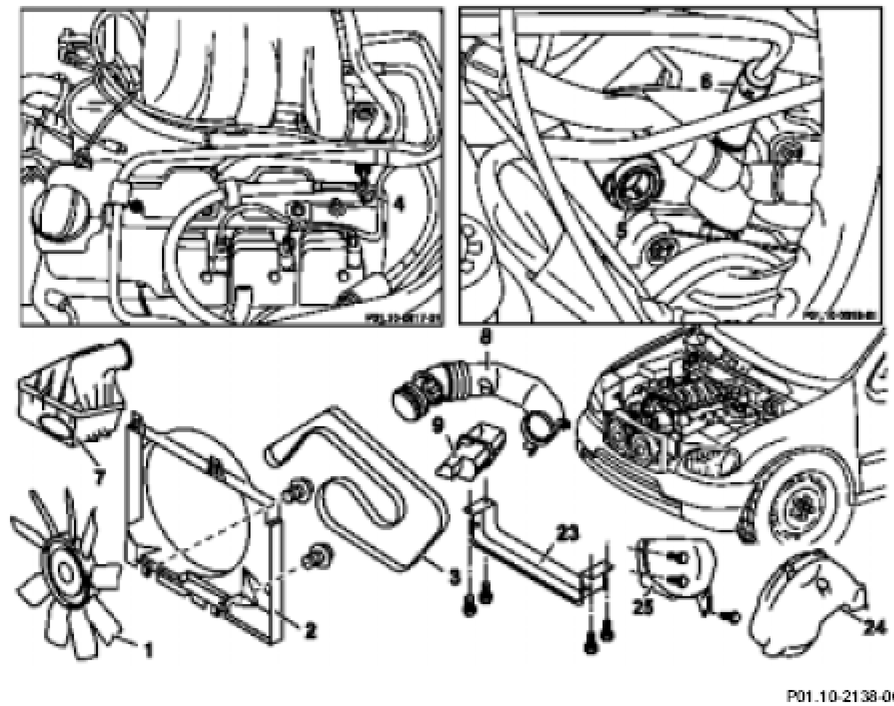


Fig. 43: Identifying Engine Remove/Install Components - Illustrated On Model 112.942

Shown on engine 112.942

10	*AC compressor*
11	*Exhaust system*
12	*Exhaust bracket*
13	*Expansion reservoir*
14	*Coolant line*
15	*Coolant line circulation pump→ coolant pump*
16	*Coolant line radiator→coolant pump*
17	*Coolant line radiator→thermostat housing*
18	*Nuts*
19	*Power steering pump*
G3/3x1	*Connector for left O2 sensor upstream of TWC*
G3/4x1	*Connector for right O2 sensor upstream of TWC*

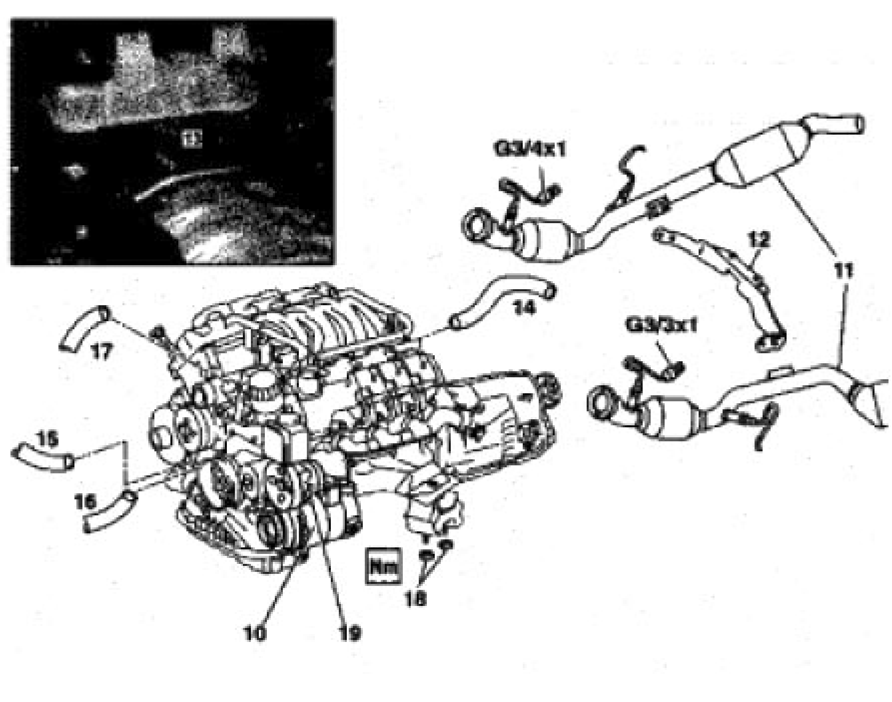
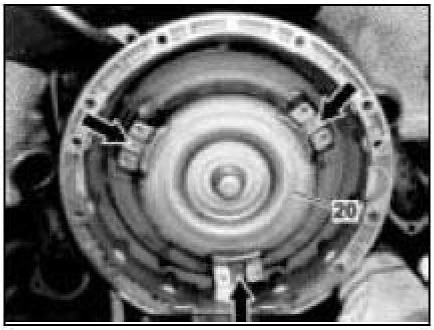


Fig. 44: Identifying Engine Remove/Install Component - Shown On Engine 112.942

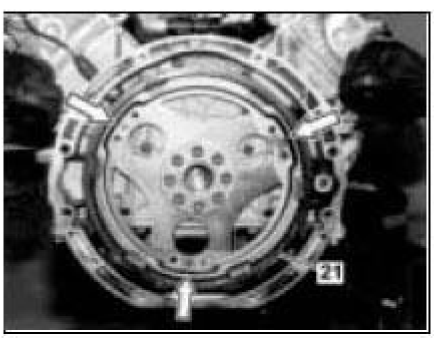
Shown on engine 112.942



20 Torque converter

Fig. 45: Identifying Torque Converter - Shown On Engine 112.942

Shown on engine 112.942



21 Starter ring gear

Fig. 46: Identifying Starter Ring Gear - Shown On Engine 112.942

Shown on engine 112.942



P27.20-2004-01

22 Transmission support

Fig. 47: Identifying Transmission Support - Shown On Engine 112.942

Modification notes

13.1.06	Bolt, torque converter to drive plate	Transmission 722.6	***BA27.20-P-1002-01C**

	Remove/install		
Danger!	**Risk of death** caused by vehicle slipping or toppling off the lifting platform.	Align vehicle between columns of lifting platform and position four support plates at lifting platform support points specified by vehicle manufacturer.	**AS00.00-Z-0010-01A**
	Notes on self-locking nuts and bolts	All models	**AH00.00-N-0001-01A**
i		External Torx set Torx bit set	**Fig. 49** **Fig. 48**
i		i 6 mm socket hexagon i 7 mm socket hexagon	***WH58.30-Z-1001-06A** ***WH58.30-Z-1002-06A**
1	Remove engine trim panel		
2 BT	Inspect both rear engine lifting eyes for marking	i Engine suspension lugs without identification must be replaced.	
BT	Rear lifting eyes of engine reinforced	BT01.00-P-0001-01A	
Danger!	**Risk of explosion** caused by oxyhydrogen gas. **Risk of poisoning and caustic burns** caused by	No fire, sparks, open flames or smoking. Wear acid-resistant gloves, clothing and glasses. Only pour battery acid into suitable and appropriately marked containers.	**AS54.10-Z-0001-01A**

	swallowing battery acid. **Risk of injury** caused by burns to skin and eyes from battery acid or when handling damaged lead-acid batteries		
3	Disconnect battery ground cable	i The battery is located in the right of the engine compartment.	**AR54.10-P-0003A**
	Notes on battery	All models i **Installation:** After connecting, read out fault memory, encode radio and normalize power windows.	**AH54.10-P-0001-01A** Vehicles with stationary heater: adjust time display on stationary heater.
4.1	Remove air guide (23)	i Engine 113.942 only.	
Danger!	**Risk of injury** to skin and eyes caused by scalding from contact with hot coolant spray. **Risk of poisoning** caused by swallowing coolant.	Do not open cooling system unless coolant temperature is below 90°C. Open cap slowly and release the pressure. Do not pour coolant into beverage containers. Wear protective gloves, protective clothing and safety glasses.	**AS20.00-Z-0001-01A**
5	Drain coolant from radiator	i Remove coolant pump line --> (16) from coolant pump.	**AR20.00-P-1142HA**
6	Drain and collect engine oil	Danger!	***BA01.45-P-1003-01B** ***BF18.00-P-1001-01H**
7.1	Remove viscous fan (1)	All except model 163.174 with engine 113.981 and 163.175 with engine 113.965. i Right-hand thread!	**AR20.40-P-5660C**
8.1	Remove fan shroud (2).	i Unscrew bolts at bottom of fan shroud	
8.2	Remove electric fan	i Only model 163.174 with engine 113.981 and 163.175 with engine 113.965.	**AR20.40-P-5000GH**
9	Attach guard plate for radiator / condenser		
WF	Guard plate for radiator / condenser	Engine 606 in MODEL 124, Engine 606.961 in MODEL 140, Engine 112, 113, 604, 605, 611.960 in MODEL	WF58.50-P-0110-01A

		202, Engine 602.983, 612.966 in MODEL 461, Engine 628.962, 612.965, 606.964, 112.945, 113.962 /982 in MODEL 463, Engine 111, 112, 611.962, 612.962 in model 203, Engine 112, 113, 611.961, 612.961, 613.961 in MODEL 210, Engine 112 in model 170, Engine 112 in MODEL 220, Engine 113 in MODEL 211, 215,220, Engine 112 in MODEL 208, Engine 112, 113, 612.963, 628.963 in MODEL 163, Engine 112.923/943, 113.961 in MODEL 129, Engine 137, 275 in MODEL 215, 220, Engine 613.960, 628.960 in MODEL 220, Engine 113.992 in model 230.474, Engine 271 in model 209, 203, Engine 285.950 in model 240.078 /178, Engine 612.967 in model 209.316, Engine 648 in model 220 Engine 112.951 in model 639.601/603 /605 /701 /703 /705 /801 /803 /805 Engine 646.983 /984 in model 639. /605 /701 /703/705/801 /803/805 Engine 646.982 in model 639.601 /603 /605 /701 /703 /705	
10	Remove expansion reservoir (13)		
11	Remove air filter housing (7).		
12	Remove resonance tube (8) and resonance unit (9)	[i] Separate plug connection of hot film mass air flow sensor (HFM) for this step and unbolt resonance pipe at cylinder head cover. [i] The resonance pipe is attached at rear at intake manifold with a plastic plate. [i] Do not damage plastic strap. Engine 112.942/970. Engine 113.942/965/981.	**AR07.07-P-1454A** **AR07.07-P-1454MV**
13	Remove coolant pump line(15)from coolant pump.		
14	Remove thermostat		

	housing coolant line --> (17) from thermostat housing		
15.1	Remove radiator	Only engine 113.942 /965 /981.	**AR20.20-P-3865HC**
16	Remove brake pressure regulator vacuum line (5) from brake pressure regulator at rear of intake manifold		
17	Extract power steering pump (19) oil	Hand pump	**Fig. 50**
18	Detach return flow line and pressure line of power steering pump (19)	Seal connections! Set of plugs Danger! Danger!	**Fig. 51** ***BA46.30-P-1002-01A** ***BA46.30-P-1003-01A**
19	Remove regeneration vacuum line (6) from intake pipe		
Danger!	**Risk of explosion** caused by ignition of flammable products, **risk of poisoning** caused by inhaling fuel vapors or swallowing fuel as well as **risk of injury** to skin and eyes exposed to fuel.	No fire, sparks, open flames or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel.	**AS47.00-Z-0001-01A**
20	Disconnect fuel line (4)	Release fuel pressure through service valve! Collect fuel. M112: ? Danger! M113: ? Danger! Pressure hose	***BA07.52-P-1001-01A** ***BA07.52-P-1001-01A** **Fig. 52**
21	Detach coolant line (14)		

22	Disconnect engine wiring harness		**AR01.00-P-2410V**
23	Remove poly V-belt (3)	i **Installation:** Lock tensioning device with a drift or pin (diameter 5 mm). Model 163.154/157/172. Model 163.174/175.	 **AR13.22-P-1202B** **AR13.22-P-1202BA**
24	Disconnect connector from A/C compressor (10)		
25	Unbolt AC compressor (10) from timing case cover	i Attach AC compressor at side in bottom of engine compartment with lines connected. ⚠ Danger!	***BA83.55-P-1001-01A**
26.1	Remove left inner fender (24)	i Only engine 113.942 /965 /981.	**AR88.10-P-1300GH**
27.1	Remove shield (25)	i Only engine 113.942 /965 /981.	
28	Detach exhaust system (11) at exhaust manifold	**Installation:** On vehicles with engine damage check exhaust system for chips before assembly and remove any chips present to prevent later damage ⚠ Danger!	***BA14.10-P-1002-01B**
29	Detach exhaust bracket (12)	Support exhaust system for this step. i **Installation:** Install new nuts.	
30	Unbolt torque converter (20) from starter ring gear(21)	i **Installation:** The mounting points (arrows, black) of the torque converter (20) must be flush with the three recesses (arrows, white) in the starting ring gear (21). ⚠ Danger!	***BA27.20-P-1002-01C**
31	Disconnect left O2 sensor connector before TWC (G3/3x1) and right O2 sensor connector before TWC (G3/4x1) from transmission	i Remove cable ties!	
32	Unscrew starter	i Do not disconnect electric cables. ⚠ Danger!	***BA15.30-P-1003-01A**
33	Unscrew bolts at transmission bell	i Engine 112.942/ 970. Do not unscrew two top bolts at transmission bell. i Engine 113.942 /965/981. Do not unscrew	

		two bottom bolts at transmission bell.	
		⚠ Danger!	***BA27.40-P-1008-01A**
34	Unscrew nuts (18) for engine mount	[i] Before unscrewing left engine mount, press oil line of power steering out of fixture. ⚠ Danger!	***BA22.10-P-1001-01L**
35	Unscrew oil filler pipe (automatic transmission) at right cylinder head cover		
36	Attach engine hoist to engine lifting eyes	[i] Use engine removal device! [i] [i]	***WE58.40-Z-1012-11A** ***WE58.40-Z-1020-11A**
37	Raise engine	[i] Ensure that engine and its detachable components are not lying against the body!	
38	Insert transmission support (22)	[i] The transmission support is inserted onto crossmember and into recess of transmission. [i] The transmission support prevents the torque converter being pulled out. At the same time, the transmission is fixed in place with the transmission support when installing the engine. [i] [Nm] ? [i]	***WE58.40-Z-1036-11A** ***WE58.40-Z-1036-11A**
39	Unscrew two top bolts (engine 112) or two bottom bolts (engine 113) of transmission bell	Ensure that engine does not hit at front against radiator or condenser damaging them	
40	Pull engine out toward front and lift out		
41	Install in the reverse order		
42	Inspect cooling system for leaks	[i] If fitting new cylinder head gaskets, bring engine to operating temperature beforehand.	**AR20.00-P-1010HA**
⚠ Danger! 43	**Risk of accident** caused by vehicle starting off by itself	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes.	**AS00.00-Z-0005-01A**

	when engine is running. **Risk of injury** caused by contusions and burns during starting procedure or when working near the engine as it is running Check for leaks with engine running	Do not touch hot or rotating parts.	
44	Read out fault memory and erase	Stored faults which can result from cables being disconnected or from simulation during removal and installation or test work, have to be processed and erased in the fault memories after completing the work: ? Diagnosis Manual Volume 2 Index 0: Connecting and using test equipment.	

⚠ Danger! **Oil pan**

Number	Designation			Engine 112.910/911/ 912/913/914/ 915/917/920/ 921/922/923/ 940/941/942/ 943/944/945/ 946/947/949/ 951/954/955/ 960/961/970/ 972/973/976	Engine 113.940/941/ 942/943/944/ 945/946/960/ 961/962/963/ 965/967/968/ 969/980/981/ 982/984/986/ 992/995
BA01.45-P-1003-01B	Oil drain screw to oil pan	M14	Nm	30	30

⚠ Danger! **Fuel distributor**

Number	Designation		Engine 112 except 112.945/951/ 960/961
BA07.52-P-1001-01A	Fuel feed line to fuel distributor	Nm	38

⚠ Danger! **Fuel distributor**

Number	Designation		Engine 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/ 963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/ 986/988
BA07.52-P-1001-01A	Fuel feed line to fuel distributor	Nm	38

⚠ Danger! **Exhaust manifold**

Number	Designation	Engine 112 except 112.951 / 976	Engine 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/ 963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/ 986/992/993/ 995
	Flange connection,		

BA14.10-P-1002-01B	exhaust manifold/front exhaust pipes	Nm	20	20

⚠ Danger! **Starter**

Number	Designation		Engine 112 except 112.951, 113.94/96/98
BA15.30-P-1003-01A	Bolt connecting starter to crankcase	Nm	42

⚠ Danger! **Engine mounts, engine supports**

Number	Designation		Engine 112.942/970 113.942/965/981 in model 163.154/157/17 2/174/175
BA22.10-P-1001-01L	Bolt, front engine mounts to front axle carrier	Nm	35

⚠ Danger! **Torque converter**

Number	Designation				Transmission 722.6 except 722.648
BA27.20-P-1002-01C	Bolt, torque converter to drive plate	Straight threaded connection		Nm	42
		Helical cut	Stage 1	Nm	4
			Stage 2	Nm	30
			Stage 3	Angle °	90

⚠ Danger! **Housing**

Number	Designation			Transmission 722.660/661/66 2/663/666/674
BA27.40-P-1008-01A	Bolt, automatic transmission to engine	M10X40	Nm	40
		M10X90	Nm	40
		M12	Nm	-

⚠ Danger! **Power steering pump**

Number	Designation			Model 163.136	Model 163.128/154/157/ 172/174/175
BA46.30-P-1002-01A	Return line to power steering pump		Nm	2	2
BA46.30-P-1003-01A	High-pressure expansion hose to power steering pump	M14x1.5	Nm	-	-
		M16x1.5	Nm	45	45

⚠ Danger! **Refrigerant compressor**

Number	Designation		Engine 111.977, 112.942, 112.970, 113.942/965/981 in model 163
BA83.55-P-1001-01A	Bolt, refrigerant compressor to bracket	Nm	20

Engine lubrication

Number	Designation			Engine 112 except 112.916/953/975	Engines 113.940/941/ 942/943/960/ 961/962/969/ 982	Engine 113.944/980/98 1/984/986/991
BF18.00-P-1001-01H	Engine oil	Filling capacity with oil filter	Liters	8.0	8.0	7.5
		Filling capacity without oil filter	Liters	7.5	-	-
		Specifications for Operating Fluids	Sheet	**BB00.40-P-0229-01A**	**BB00.40-P-0229-01A**	**BB00.40-P-0229-01A**
			Sheet	**BB00.40-P-0229-03A**	**BB00.40-P-0229-03A**	**BB00.40-P-0229-03A**
			Sheet	**BB00.40-P-0229-05A**	**BB00.40-P-0229-05A**	**BB00.40-P-0229-05A**

Engine lubrication

Number	Designation			Engine 113.963/965/968
BF18.00-P-1001-01H	Engine oil	Filling capacity with oil filter	Liters	7.5
		Filling capacity without oil filter	Liters	7.0
		Specifications for Operating Fluids	Sheet	**BB00.40-P-0229-01A**
			Sheet	**BB00.40-P-0229-03A**
			Sheet	**BB00.40-P-0229-05A**

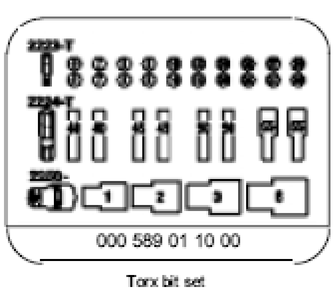


Fig. 48: Identifying Torx Bit Set (000 589 01 10 00)



Fig. 49: Identifying External Torx Set (001 589 76 09 00)

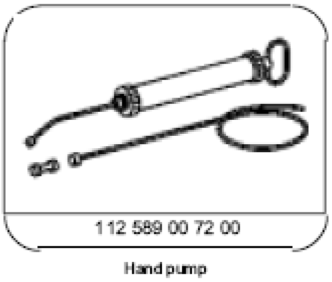


Fig. 50: Identifying Hand Pump (112 589 00 72 00)

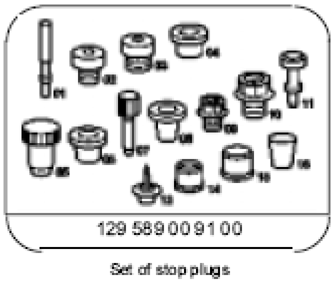


Fig. 51: Identifying Set Of Stop Plugs (129 589 00 91 00)

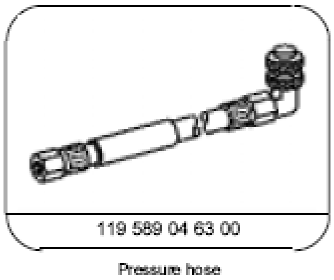


Fig. 52: Identifying Pressure Hose (119 589 04 63 00)

Commercially available tools

Number	Designation
WH58.30-Z-1001-06A	6 mm socket hexagon on flexible shaft for hose clamps with worm drive
WH58.30-Z-1002-06A	7 mm socket hexagon on flexible shaft for hose clamps with worm drive

Workshop equipment

WE58.40-Z-1012-11A	Load regulator (engine hoist), self-locking
WE58.40-Z-1020-11A	Removal fixture for engine
WE58.40-Z-1036-11A	Transmission support

ENSURE GASKET OF CYLINDER HEAD COVER IS CORRECTLY INSTALLED - AR01.20-P-5014-01B

1. Inspect gasket (arrows) of cylinder head cover to ensure it is correctly located in the sealing groove of the

cylinder head cover, particularly at the rear of the cylinder head.

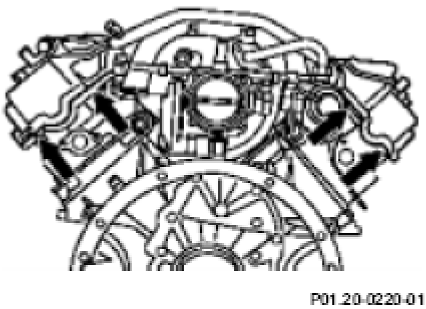


Fig. 53: Locating Cylinder Head Cover Gasket

REMOVE/INSTALL CYLINDER HEAD COVER - AR01.20-P-5014B

ENGINE 112

Air filter positioned at vehicle side.

ENGINE 113

Air filter positioned at vehicle side.

Shown on engine 112

1 Air filter housing
2 Resonance unit
3 Resonance tube
4 Right cylinder head cover
5 Left cylinder head cover
6 Right ignition coils
7 Left ignition coils
8 Right connection
9 Left connection
10 Left connection

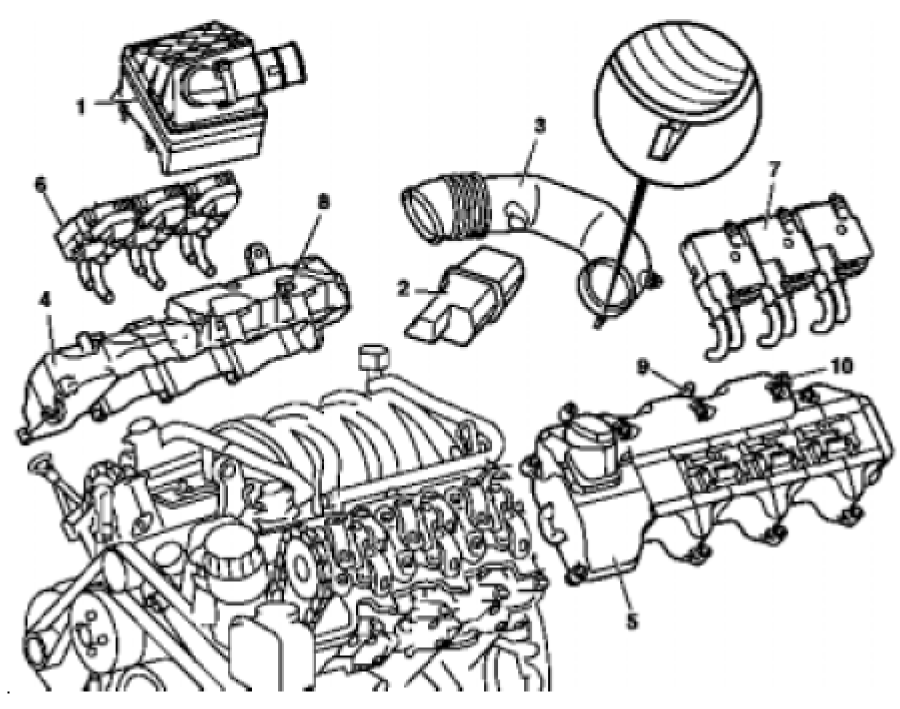


Fig. 54: Identifying Cylinder Head Cover Remove/Install Component - Shown On Engine 112

l	**Remove/install**		
i		External torx set Torx bit set	**Fig. 49** **Fig. 48**
1	Remove engine trim panel		
2	Remove air filter housing (1).		
3	Remove resonance body (2)		
4	Remove the resonance tube (3) with hot film mass air flow sensor	i At this time pull out the hot film mass air flow sensor plug. **Removal:** Pay attention to the mounting projection of the resonance tube (3)! All except model 163 with engine 113.942/981 Model 163 with engine 113.942/981	 **AR07.07-P-1454A** **AR07.07-P-1454MV**
5	Unbolt dipstick guide tube of automatic transmission		
6	Unbolt ignition coils (6, 7) at cylinder head covers	Danger!	**AR15.12-P-2003A** ***BA01.20-P-1002-01E**
7	Disconnect spark plug connectors	i Pay attention to markings for spark plug connectors on cylinder head covers and ignition coils	**Fig. 57**
8	Detach the vacuum hoses at connections (8, 9) of the cylinder head covers		
9	Detach crankcase ventilation hose at cylinder head cover fitting (10)	i Only on left side.	
Danger! 10	**Risk of explosion** caused by ignition of flammable products, **risk of poisoning** caused by inhaling fuel vapors or swallowing fuel as well as **risk of injury** to skin and eyes exposed to fuel. Disconnect fuel line at fuel	No fire, sparks, open flames or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel. i Only in case of	**AS47.00-Z-0001-01A**

	rail	vehicles with a non-flexible fuel line. Release fuel pressure through service valve! Pressure hose Danger! Danger!	**Fig. 52** ***BA07.52-P-1001-01A** ***BA07.52-P-1001-01A**
11	Remove cylinder head covers (4, 5)	Danger! **Installation:** Ensure cylinder head cover gasket is correctly installed.	***BA01.20-P-1001-01E** **AR01.20-P-5014-01B**
12	Install in the reverse order		
Danger! 13	**Risk of accident** caused by vehicle starting off by itself when engine is running. **Risk of injury** caused by contusions and burns during starting procedure or when working near the running engine Run engine and inspect for leaks	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes. Do not grasp hot or rotating parts.	**AS00.00-Z-0005-01A**

Danger! **Crankcase ventilation, cylinder head cover**

Number	**Designation**		**Engine 112.910/911/ 912/913/914/ 915/916/917/ 920/921/922/ 923/940/941/ 942/943/944/ 945/946/947/ 949/951/953/ 954/955/960/ 961/970/972/ 973/975/976**	**Engines 113.940/ 941/942/943/ 944/948/960/ 961/962/963/ 964/965/966/ 967/968/969/ 971/980/981/ 982/984/986/ 992/995**	**Engine 113.987/988/ 990/991/993**
BA01.20-P-1001-01E	Screw of cylinder head cover	Nm	8	10	8
BA01.20-P-1002-01E	Bolt of ignition coils to cylinder head cover	Nm	8	8	8

Danger! **Fuel rail**

Number	**Designation**	**Engine 112 except 112.945/951/ 960/961**	**Engine 112.945**	**Engine 112.960/ 976**	**Engine 112.960/ 961 AMG**

BA07.52-P-1001-01A	Disconnect fuel feed line at fuel rail Nm	38	38	24	35

⚠ Danger! **Fuel rail**

Number	Designation	Engine 113.987	Engines 113.990/ 991	Engine 113.990/ 993/995	Engines 113.990/ 942/943/944/ 945/946/948/ 960/961/962/ 963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/ 986/988
BA07.52-P-1001-01A	Disconnect fuel feed line at fuel rail Nm	38	38	38	38

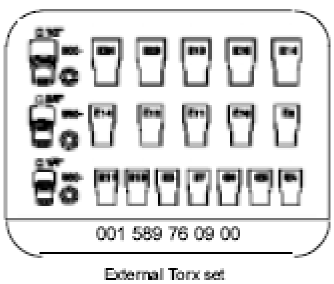


Fig. 55: Identifying External Torx Set (001 589 76 09 00)

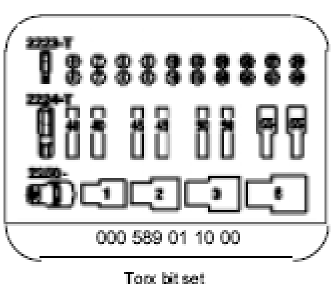


Fig. 56: Identifying Torx Bit Set (000 589 01 10 00)

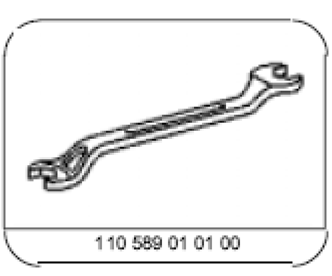


Fig. 57: Identifying Double Open-End Wrench (110 589 01 01 00)

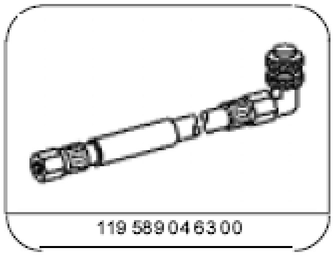


Fig. 58: Identifying Pressure Hose (119 589 04 63 00)

REMOVE/INSTALL CYLINDER HEAD COVER - AR01.20-P-5014BV

ENGINE 112

Air filter motor page arranged

ENGINE 113 (except 113.995) in MODEL 129, 163, 202, 203, 208, 209, 210, 211, 215, 220, 230

Air filter motor page arranged

ENGINE 112.945 in MODEL 463.209 /232 /233 /244 /245 /250

ENGINE 113.962 in MODEL 463.206 /240 /241 /247 /248 /249 /254

ENGINE 113.982 in MODEL 463.243/246

Shown on engine 112.945

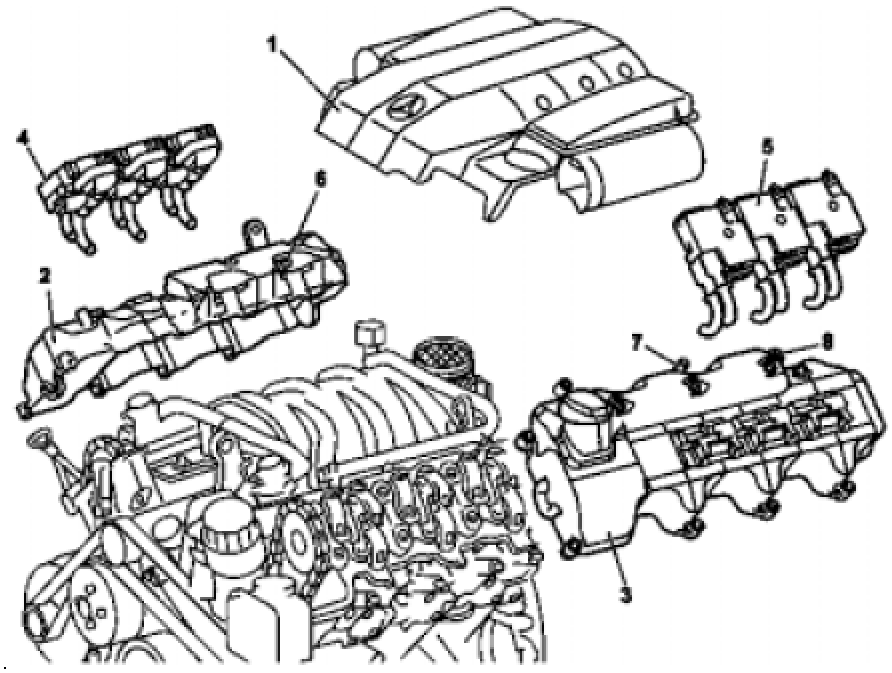


Fig. 59: Identifying Cylinder Head Cover Remove/Install Component - Shown On Engine 112.945

	Remove/install		
1.1	Remove engine trim panel with integrated air filter (1)	[i] Unclip covering on front side of engine. Remove air filter by pulling vertically up and off the cylinder head covers.	
1.2	Remove air filter	Model 170.466 Model 203.065/265, Model 211.076/276, Models 215.374, 220.074/174, Model 230.474	AR09.10-P-1150SVK
2.1	Unscrew the guide tube of the automatic transmission oil dipstick	except models 170 Models 203, 209.375, Model 208 Models 211.061/065/070, Model 230.475	
3	Detach right ignition coils (4), left ignition coils (5) on right cylinder head cover (2) and left cylinder head cover (3)	Except engines 112.911/914/915/917/954, Engine 113.969 ⚠ Danger!	**AR15.12-P-2003A** ***BA01.20-P-1002-01E**
4	Disconnect spark plug connectors	[i] **Installation:** Observe marking for spark plug connectors on the cylinder head covers and ignition coils.	

		Double open-ended wrench	**Fig. 57**
5	Pull off vent hoses on right connector (6) and on left connector (7) of the right cylinder head cover (2) and left cylinder head cover (3)		
6	Pull off engine vent hose on left connector (8) of left cylinder head cover (3)		
⚠ Danger!	**Risk of explosion** caused by fuel igniting, **risk of poisoning** caused by inhaling and swallowing fuel as well as **risk of injury** to eyes and skin caused by contact with fuel.	No fire, sparks, open flames or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel, date service.	**AS47.00-Z-0001-01A**
7.1	Disconnect fuel line at fuel rail	Only in case of vehicles with a non-flexible fuel line and. Models 211.061/065/070/076/276, Model 215.374 Model 220.074 Model 230.474/475 Release fuel pressure through service valve! ⚠ Danger! Engine 112 ⚠ Danger! Engine 113 Pressure hose	 ***BA07.52-P-1001-01A** ***BA07.52-P-1001-01A** **Fig. 52**
8	Remove right cylinder head cover (2) and left cylinder head cover (3)	**Installation:** Check cylinder head covers for leaks, see: ? Ensure cylinder head cover gasket is correctly installed. ⚠ Danger!	 **AR01.20-P-5014-01B** ***BA01.20-P-1001-01E**
9	Install in the reverse order		
⚠ Danger! 10	**Risk of accident** caused by vehicle starting off by itself when engine is running. **Risk of injury** caused by contusions and burns during starting procedure or when working near the running	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes. Do not grasp hot or rotating parts.	**AS00.00-Z-0005-01A**

	engine Run engine and inspect for leaks		

⚠ Danger! **Crankcase ventilation, cylinder head cover**

Number	Designation		Engines 112.910/911/ 912/913/914/ 915/916/917/ 920/921/922/ 923/940/941/ 942/943/944/ 945/946/947/ 949/951/953/ 954/955/960/ 961/970/972/ 973/975/976	Engines 113.940/ 941/942/943/ 944/948/960/ 961/962/963/ 964/965/966/ 967/968/969/ 971/980/981/ 982/984/986/ 992/995	Engines 113.987/988/ 990/991/993
BA01.20-P-1001-01E	Screw of cylinder head cover	Nm	8	10	8
BA01.20-P-1002-01E	Bolt of ignition coils to cylinder head cover	Nm	8	8	8

⚠ Danger! **Fuel rail**

Number	Designation		Engine 112 except 112.945/951/ 960/961	Engine 112.945	Engines 112.960/ 961 AMG
BA07.52-P-1001-01A	Disconnect fuel feed line at fuel rail	Nm	38	38	35

⚠ Danger! **Fuel rail**

Number	Designation		Engine 113.987	Engines 113.990/ 991	Engine 113.992/ 993/995	Engines 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/ 963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/ 986/988
BA07.52-P-1001-01A	Disconnect fuel feed line at fuel rail	Nm	38	38	38	38

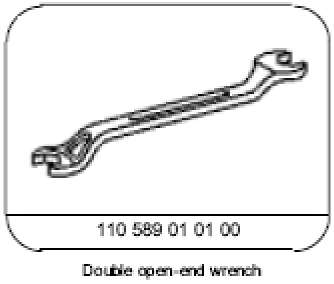


Fig. 60: Identifying Double Open-End Wrench (110 589 01 01 00)

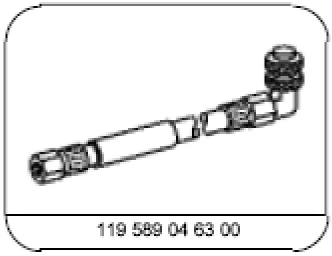


Fig. 61: Identifying Pressure Hose (119 589 04 63 00)

TAP THREAD IN SPARK PLUG HOLE AND SCREW IN THREADED INSERT - AR01.30-P-5440-01B

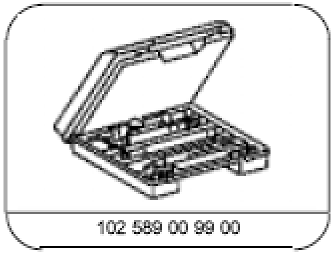


Fig. 62: Identifying Heli-Coil Repair Set (102 589 00 99 00)

1. Remove pilot bushing (1) of tapped hole device .
2. Fill the swarf grooves of the combination tap (4) with grease for bonding the swarfs.
3. Cut combination tap (4) into corresponding spark plug thread. Screw in combination tap (4) until the guide tube (3) is seated and forms a fully compress with the stop ring (2).

   Screw out after 5 revolutions on removed cylinder head combination tap (4), clean the swarf grooves from swarfs and grease, refill with grease and finish cutting thread. After cutting.

   Blow out spark plug thread and cylinder with compressed air.

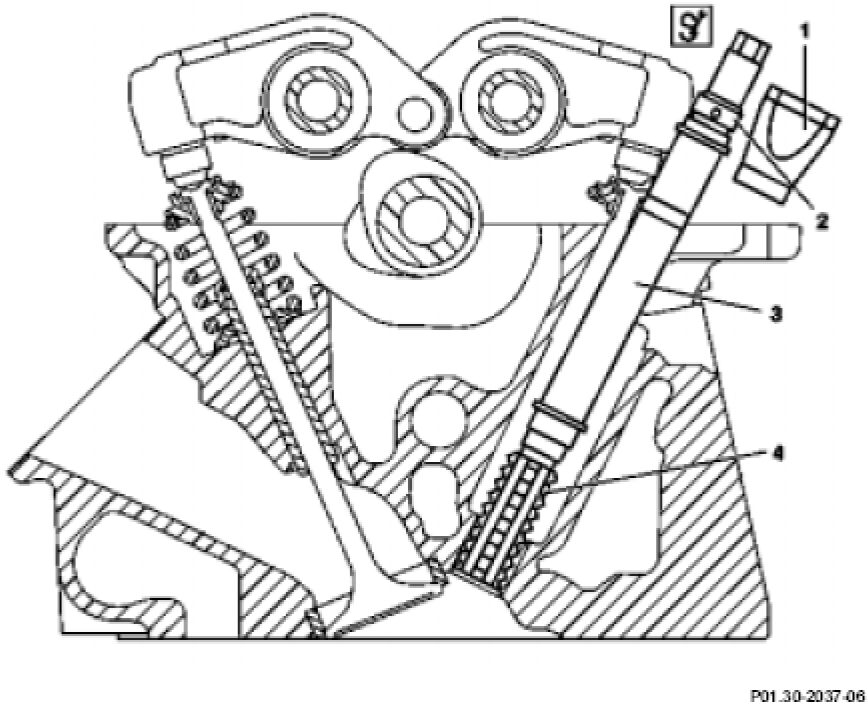


Fig. 63: Identifying Pilot Bushing, Stop Ring, Guide Tube And Combination Tap

4. Select heli-coil threaded insert (8) with block length 10.2 mm.
5. Insert threaded insert (8) with primary pump drive pointing in direction of prestessing cartridge (16) in the installation tool (13) (arrow).
6. Screw in threaded insert (8) flush to prestessing cartridge (16) (arrow).

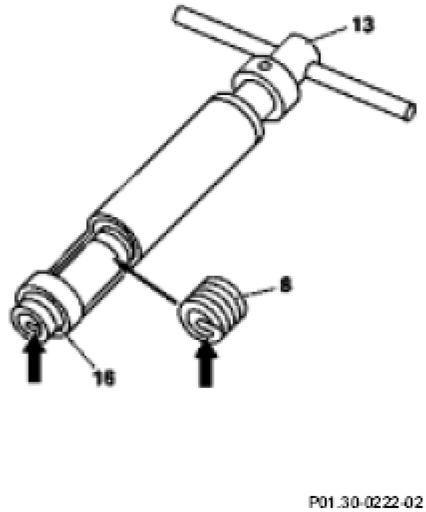


Fig. 64: Identifying Installation Tool, Threaded Insert And Cartridge

7. Position HC-installation tool on tapped hole

8. Hold jacket sleeve (5)
9. Rotate screw-in spindle (6) until the stop ring (7) is positioned on the jacket sleeve (5). Slightly turn back a clamping jacket sleeve when screwing-in.

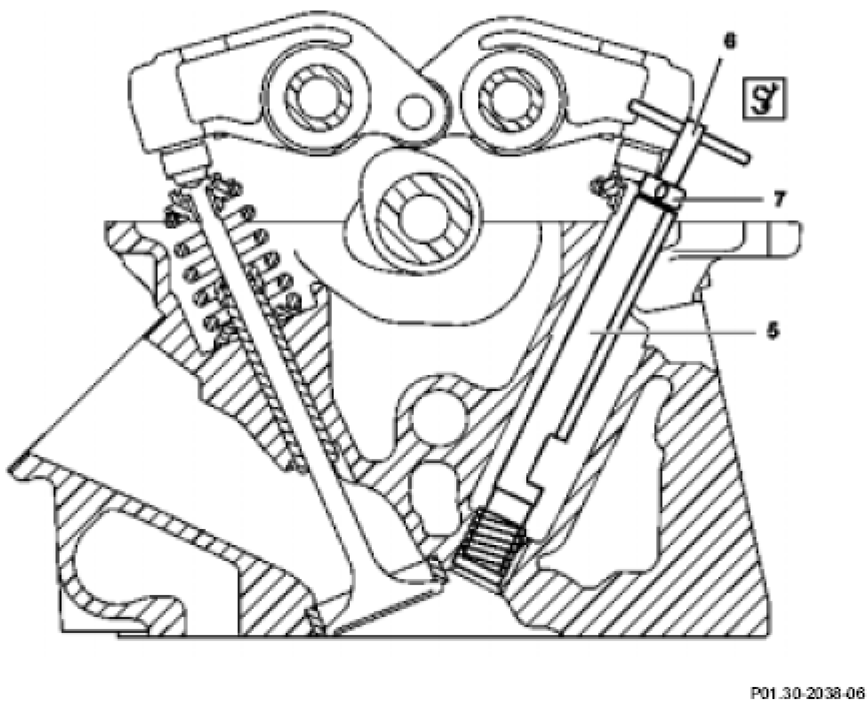
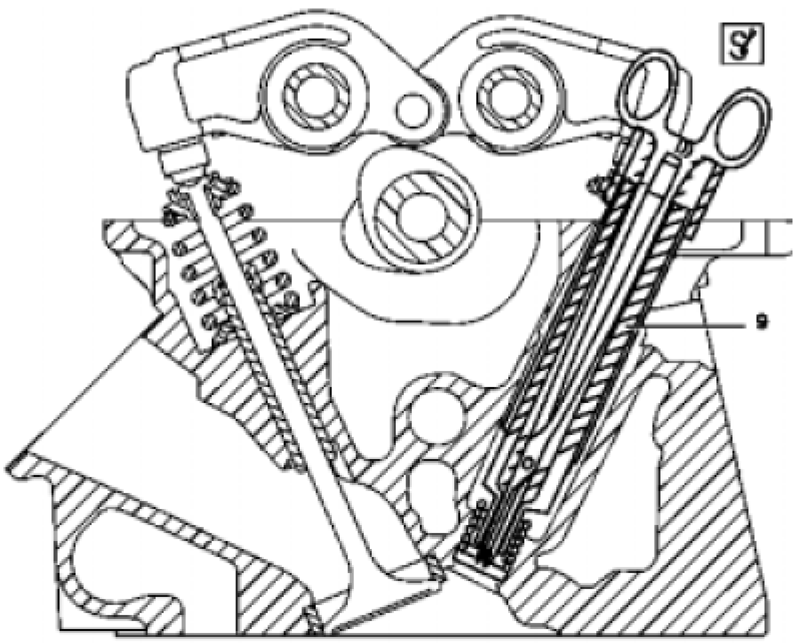


Fig. 65: Identifying Jacket Sleeve, Spindle And Stop Ring

10. Insert sleeve (9) via primary pump drive of HELI-COIL insert
11. Guide open pliers to the marking in the sleeve (9) and fix with primary pump drive
12. Close pliers , the serrated lock of pliers must latch.
13. Rotate sleeve (9) toward left as far as the stop and hold
14. Dismount primary pump drive, to do so move pliers slightly up and down.

i Remove with a magnet the primary pump drive which had fallen onto the piston crown!



P01.30-2039-06

Fig. 66: Identifying Sleeve & Pliers

CAULK THREADED INSERT - AR01.30-P-5440-02B



Fig. 67: Identifying Heli-Coil Repair Set (102 589 00 99 00)

1. Grease caulk drift, screw into installed HELI-COIL insert and tighten with a torque of approx. 25-30 Nm.

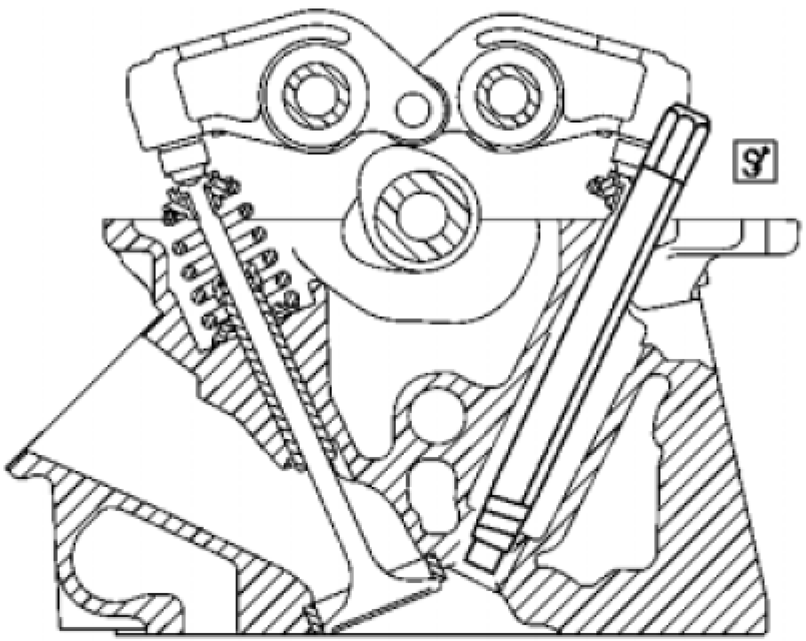


Fig. 68: Identifying Caulk Drift

REPAIRING SPARK PLUG THREAD - AR01.30-P-5440BV

ENGINE 112

ENGINE 112.945 in MODEL 463.209 /232 /233 /244 /245 /250

ENGINE 113.962 in MODEL 463.206 /240 /241 /247 /248 /249 /254

ENGINE 113.982 in MODEL 463.243/246

ENGINE 113 (except 113.995) in MODEL 129, 163, 202, 203, 208, 209, 210, 211, 215, 220, 230

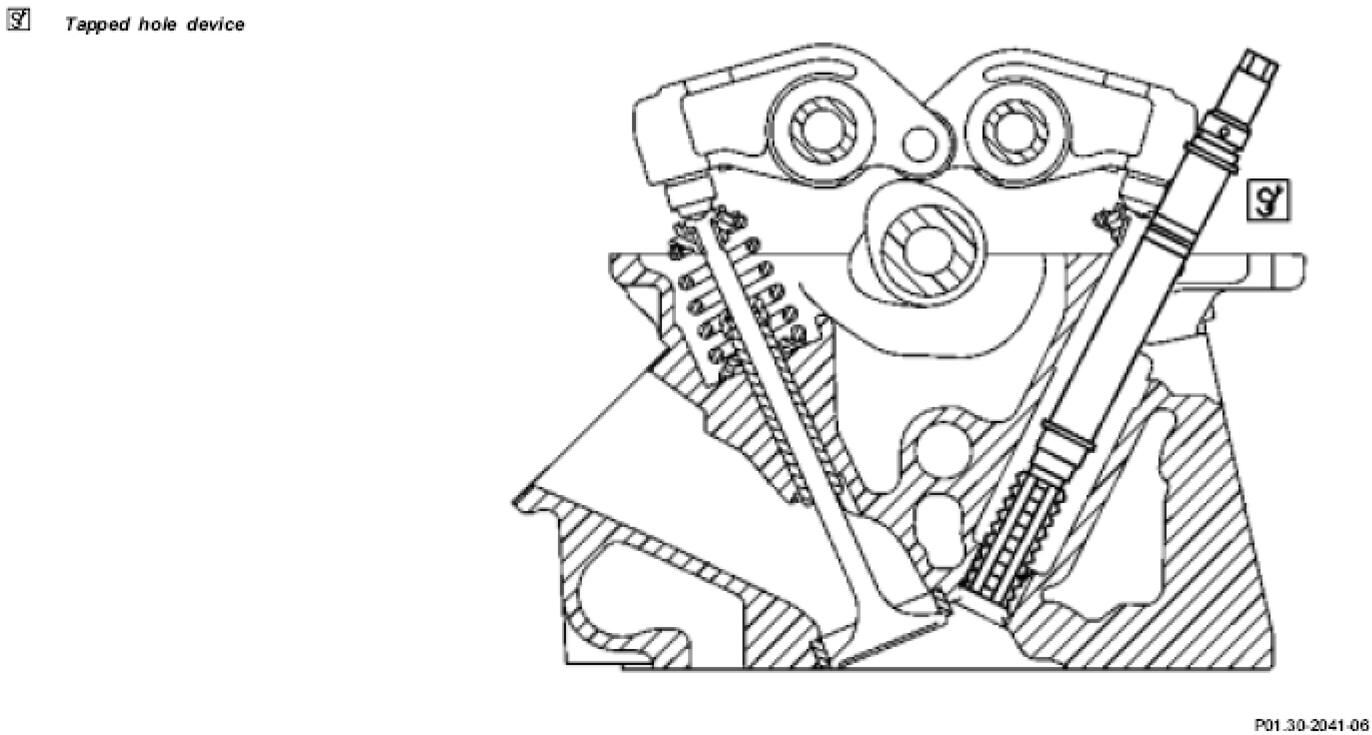


Fig. 69: Identifying Tapped Hole Device

	Remove, Install		
1	Remove cylinder head cover	Air cleaner located at vehicle side. Air cleaner located at engine side.	**AR01.20-P-5014B** **AR01.20-P-5014BV**
2 AP	Remove spark plugs	Model 463.206/209/ 232/233/240/241/243/244/245/ 246/247/248/249 /250/254	AP15.10-P-1580GA
AP		Model 220, 230.474/475, 211.061/065/070	AP15.10-P-1580AB
AP		Model 170, 202, 203, 208, 209, 210	AP15.10-P-1580A
AP		Model 129	AP15.10-P-1580AC
AP		Model Series 163	**AP15.10-P-1580GH**
3	Position		

	piston of relevant cylinder to 20° - 30° before TDC	Inlet valve and exhaust valve of the relevant cylinder must be closed.	
4	Remove cylinder head	Model 230.474 with Engine 113.992 replace cylinder head if spark plug thread is faulty. It is then only necessary to remove the cylinder head if it is not possible to insert the thread tap unit into the spark plug thread for space reasons! Model 463.206 /209 /232 /233 /240 /241 /243 /244 /245 /246 /247 /248 /249 /250 /254. Model 202, 208, 210 with Engine 113 and Model 129 with Engine 112, 113 Model 220 with Engine 112, 113 and Model 210, 170, 202, 208 with Engine 112, 230.474/475 Model 203, 209, 211.061/065 /070 Model Series 163	AR01.30-P-5800GV AR01.30-P-5800B AR01.30-P-5800BA AR01.30-P-5800PV **AR01.30-P-5800MV**
5	Tap thread in spark plug hole and screw in threaded insert	Pack the swarf grooves of the combination thread tap with grease for bonding the swarf. Blow out cylinder and spark plug thread with compressed air before screwing in the threaded insert.	**AR01.30-P-5440-01B** **Fig. 62**
6	Crank engine with starter.	If the cylinder head was not removed, the engine must be cranked several times with the starter. All Models except Model 203, 209 Model 203, 209	**AR01.10-P-0110V** AR01.10-P-0110PV
7	Caulk threaded insert		**AR01.30-P-5440-02B**
8	Install in the reverse order		

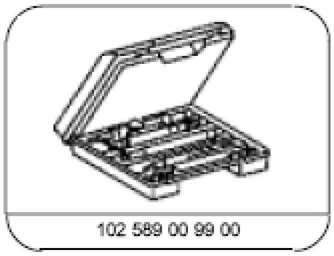


Fig. 70: Identifying Heli-Coil Repair Set (102 589 00 99 00)

CHECKING CYLINDER HEAD BOLTS - AR01.30-P-5800-03B

Cylinder head/Cylinder head bolts

Number	Designation			Engines 112.910/911/912/913/914/915/916/917/920/921/922/923/940/941/942/943/944/945/946/947/949/951/953/954/955/960/961/970/972/973/975/976	Engines 113.940/941/942/943/944/945/946/948/960/961/962/963/964/965/966/967/968/969/971/980/981/982/984/986/987/988/990/991/992/993/995
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	11	11
		Length (L) when new	mm	141.5	141.5
		Length (L)	mm	< or = 144.5	< or = 144.5
		See picture		**AR01.30-P-5800-03B**	**AR01.30-P-5800-03B**

Cylinder head/cylinder head bolts

Number	Designation			Engine 113.989
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	11
		Length (L) when new	mm	141.5
		Length (L)	mm	< or = 144.5
		See picture		**AR01.30-P-5800-03B**

1. Measure length (L) of cylinder head bolts.

i If the length (L) exceeds the maximum permissible dimension then the cylinder head bolts must be replaced.

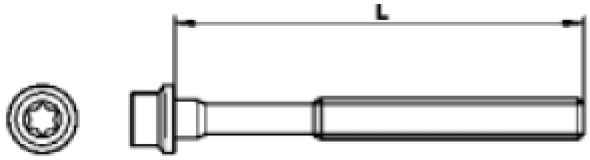


Fig. 71: Identifying Length Of Cylinder Head Bolts

TIGHTENING INSTRUCTIONS FOR CYLINDER HEAD BOLTS - AR01.30-P-5800-07B

⚠ Danger! **Cylinder head**

Number	Designation			Engines 112.910/911/912/913/914/915/916/917/920/921/922/923/940/941/942/943/944/945/946/947/949/951/953/954/955/960/961/970/972/973/975/976	Engines 113.940/941/942/943/944/948/960/961/962/963/965/966/967/968/969/971/980/981/982/984/986	Engine 113.987/988	Engine 113.987/991/992/993/995
BA01.30-P-1001-01D	Bolt, cylinder head to crankcase	Stage 1	Nm	10	10	10	10
		Stage 2	Nm	30	30	30	30
		Stage 3	Angle °	90	90	90	90
		Stage 4	Angle °	90	90	90	90

⚠ Danger! **Cylinder head**

Number	Designation			Engine 113.989	Engine 113.964
BA01.30-P-1001-01D	Bolt, cylinder head to crankcase	Stage 1	Nm	10	10
		Stage 2	Nm	30	30
		Stage 3	Angle °	90	90
		Stage 4	Angle °	90	90

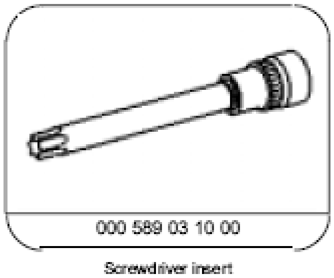


Fig. 72: Identifying Screwdriver Insert (000 589 03 10 00)

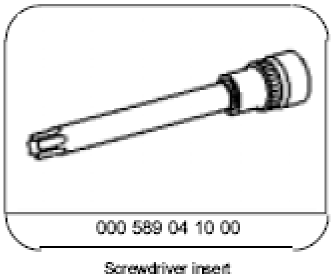


Fig. 73: Identifying Screwdriver Insert (000 589 04 10 00)

Tightening pattern/bolt assignment

Left and right cylinder head M 112

1-8 Collar bolt M11

a. a Combination bolts M850(to timing case cover)
b. b Combination bolts M830(to timing case cover)

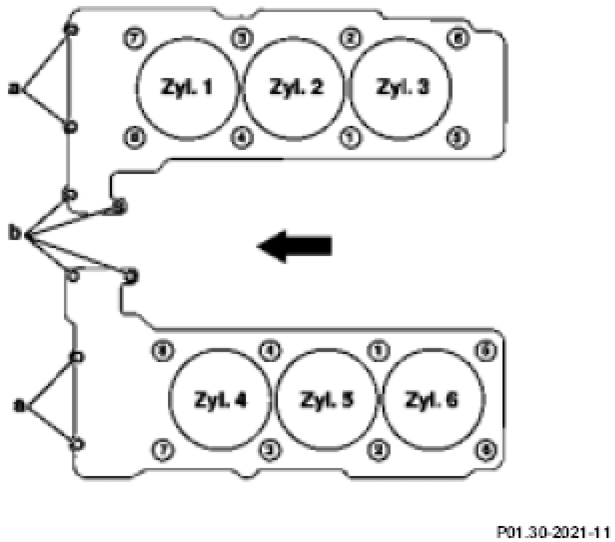


Fig. 74: Identifying Tightening Pattern/Bolt Assignment (Left And Right Cylinder Head M 112)

Tightening instructions for left and right cylinder heads M 112

Use wrench bit to tighten cylinder head bolts.

Observe sequence, see tightening pattern.

If the tightening torque is exceeded on a cylinder head bolt, unscrew the cylinder head bolt, inspect shank length of the cylinder head bolt in question (replace bolt if necessary) and tighten again fully, beginning with stage 1.

Cylinder head bolts must not be retightened.

Tightening diagram/bolt assignment

Left and right cylinder head M 113

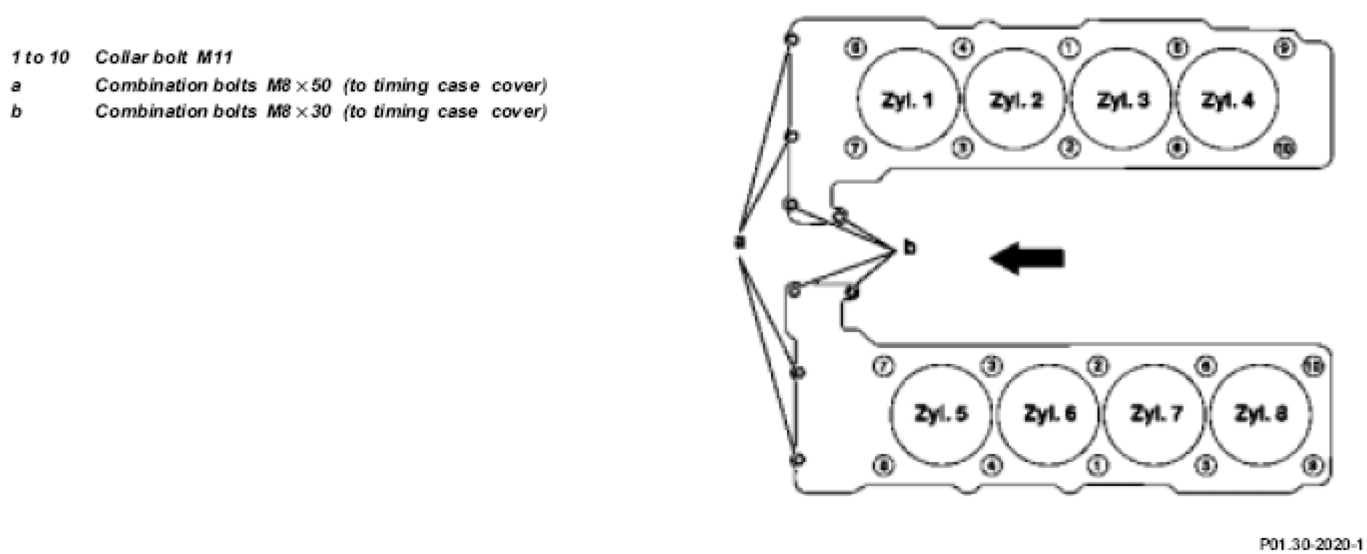


Fig. 75: Identifying Left And Right Cylinder Head M 112 (Left And Right Cylinder Head M 113)

Tightening instructions for left and right cylinder heads M 113

Use wrench bit to tighten cylinder head bolts.

Observe sequence, see tightening pattern.

If the tightening torque is exceeded on a cylinder head bolt, unscrew the cylinder head bolt, inspect shank length of the cylinder head bolt in question (replace bolt if necessary) and tighten again fully, beginning with stage 1.

□ **Cylinder head bolts must not be retightened.**

SLACKENING DIAGRAM FOR CYLINDER HEAD BOLTS - AR01.30-P-5800-09B

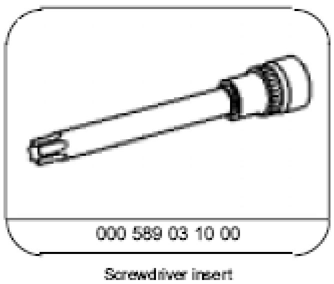


Fig. 76: Identifying Screwdriver Insert (000 589 03 10 00)

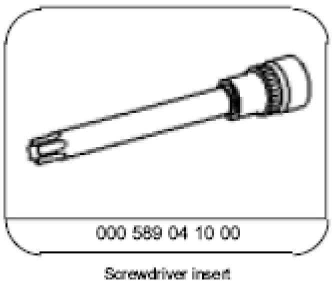


Fig. 77: Identifying Screwdriver Insert (000 589 04 10 00)

Engine 112

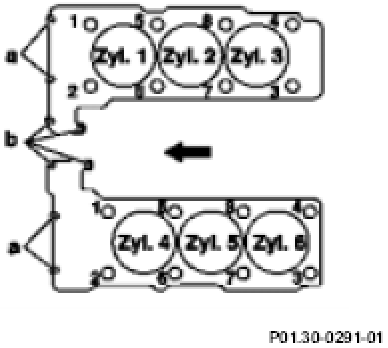


Fig. 78: Identifying Loosening Sequence Of Cylinder Head Bolts - Engine 112

1. Unscrew bolts (a, b).

   Engine 113

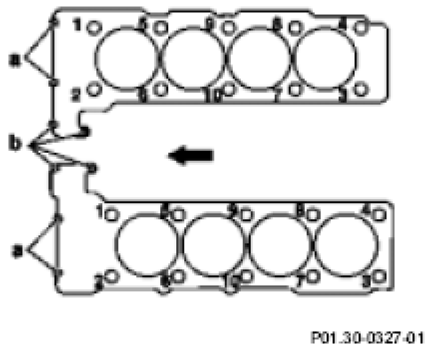


Fig. 79: Identifying Loosening Sequence Of Cylinder Head Bolts - Engine 113

2. Loosen cylinder head bolts (1 to 8 or 10) as per the numerical sequence and remove.

REMOVE/INSTALL CYLINDER HEAD - AR01.30-P-5800MV

ENGINE 112.942 in MODEL 163.154

ENGINE 112.970 in MODEL 163.157

ENGINE 113.942 in MODEL 163.172

ENGINE 113.981 in MODEL 163.174

ENGINE 113.965 in MODEL 163.175

Shown on model 163.154 with engine 112

1	Air baffle
2	Viscous fan
3	Fan shroud
4	Bolts
5	Air filter housing
6	Air intake pipe
7	Resonance unit
8	Poly-V-belt
9	Fender liner
10	Shield
11	Exhaust bracket

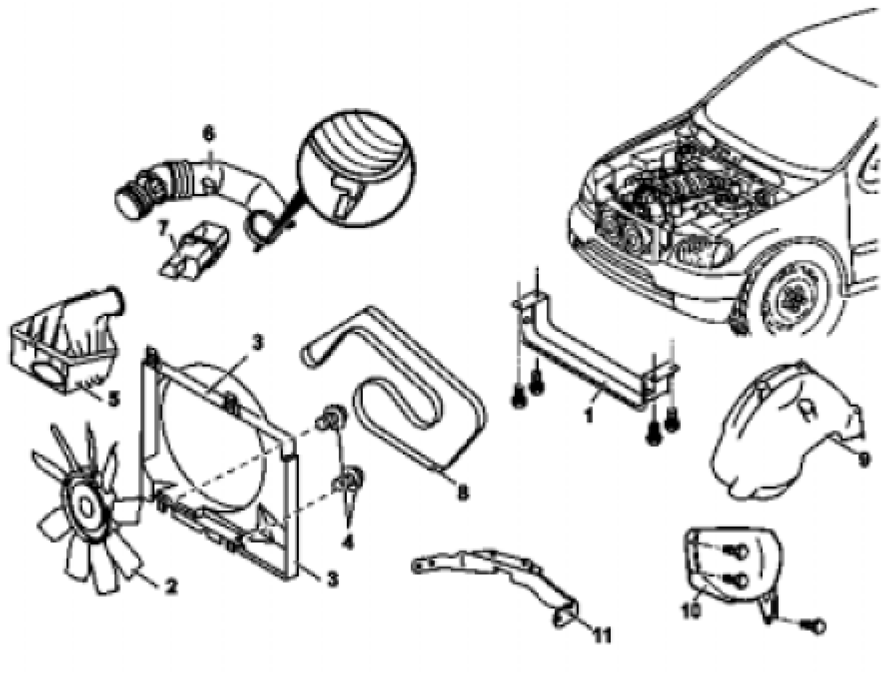


Fig. 80: Identifying Cylinder Head Remove/Install Components - Shown On Model 163.154 With Engine 112 (1 Of 3)

12	Right and left ignition coils
13	Left and right cylinder head covers
14	Intake manifold
15	Camshaft position sensor
16	Coolant line
17	Chain tensioner
18	Oil filter housing
19	Camshaft sprockets
28	Camshaft bearing bridges

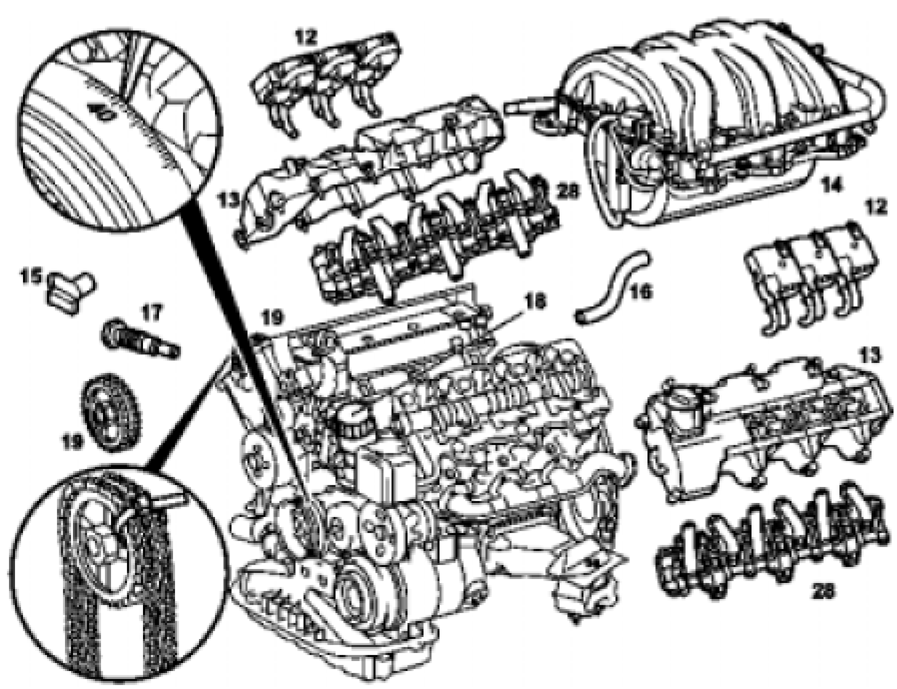


Fig. 81: Identifying Cylinder Head Remove/Install Components - Shown On Model 163.154 With Engine 112 (2 Of 3)

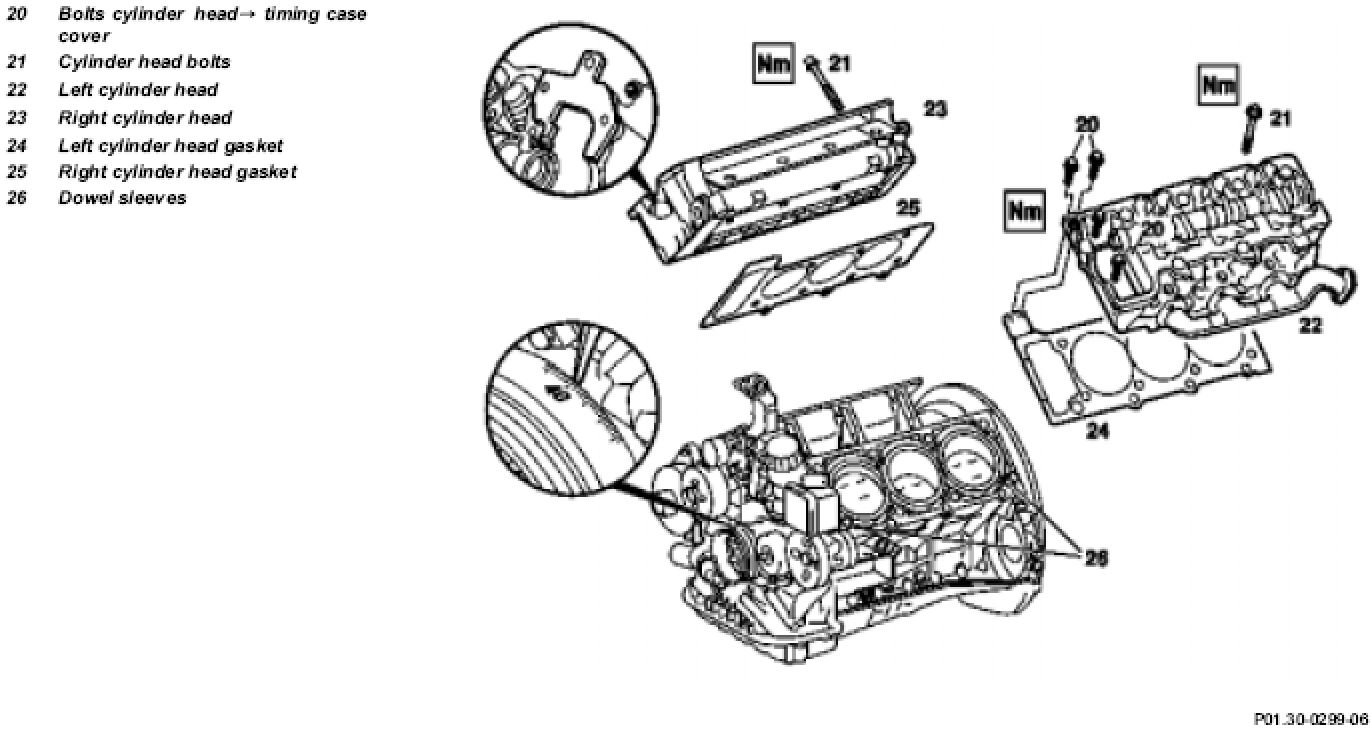


Fig. 82: Identifying Cylinder Head Remove/Install Components - Shown On Model 163.154 With Engine 112 (3 Of 3)

	Remove/install		
	Notes on self-locking nuts and bolts	All models	**AH00.00-N-0001-01A**
i		External torx set Torx bit set	**Fig. 49** **Fig. 48**
Danger!	**Risk of explosion** caused by oxyhydrogen gas. **Risk of poisoning and caustic burns** caused by swallowing battery acid. **Risk of injury** caused by burns to skin and eyes from battery acid or when handling damaged lead-acid batteries	No fire, sparks, open flames or smoking. Wear acid-resistant gloves, clothing and safety glasses. Only pour battery acid into suitable and appropriately marked containers.	**AS54.10-Z-0001-01A**
1	Disconnect battery ground cable	i **Installation:** After connecting, read out fault memory, encode radio and normalize power windows. Vehicles with stationary heater: Set clock of	**AR54.10-P-0003A**

		stationary heater timer.	
ⓘ	Notes on battery	All models	**AH54.10-P-0001-01A**
⚠ Danger!	**Risk of death** caused by vehicle slipping or toppling off of the lifting platform.	Align vehicle between the columns of the lifting platform and position the four support plates below the lifting platform support points specified by the vehicle manufacturer.	**AS00.00-Z-0010-01A**
2	Place the vehicle on lifting platform		**AR00.60-P-1000GH**
3.1	Remove air guide (1)	ⓘ Only for engine 113.942.	
⚠ Danger!	**Risk of injury** to skin and eyes caused by scalding from contact with hot coolant spray. **Risk of poisoning** from swallowing coolant.	Do not open cooling system unless coolant temperature is below 90°C. Open cap slowly and release the pressure. Do not pour coolant into beverage containers. Wear protective gloves, protective clothing and safety glasses.	**AS20.00-Z-0001-01A**
4	Drain coolant	ⓘ Detach coolant hose at bottom of radiator.	**AR20.00-P-1142HA**
5	Remove engine trim panel		
6.1	Remove viscous fan (2)	ⓘ All except model 163.174 /175 with Engine 113.981 /965. ⓘ Right-hand thread!	**AR20.40-P-5660C**
7.1	Remove fan shroud (3)	ⓘ Only model 163.154 /157 /172. unscrew screws (4) of bottom fan shroud.	
7.2	Remove electric fan	ⓘ Only models 163.174/ 175.	**AR20.40-P-5000GH**
8	Attach guard plate for radiator / condenser		
☞ WF	Guard plate for radiator / condenser	Engine 606 in model 124, Engine 606.961 in model 140, Engines 112, 113, 604, 605, 611.960 in model 202, Engines 602.983, 612.966 in model 461, Engine 628.962, 612.965, 606.964, 112.945, 113.962/982 in model 463, Engines 111, 112, 611.962, 612.962 in model 203, Engines 112, 113, 611.961, 612.961, 613.961 in model 210, Engine 112 in model 170, Engine 112 in model 220, Engine 113 in models 211, 215, 220,	WF58.50-P-0110-01A

		Engine 112 in model 208, Engine 112, 113, 612.963, 628.963 in model 163, Engines 112.923/943, 113.961 in model 129, Engines 137, 275 in models 215, 220, Engines 613.960, 628.960 in model 220, Engine 113.992 in model 230.474, Engine 271 in MODELS 209, 203, Engine 285.950 in models 240.078 /178, Engine 612.967 in model 209.316, Engine 648 in model 220 Engine 112.951 in model 639.601/603 /605 /701 /703 /705 /801 /803 /805 Engine 646.983 /984 in model 639. /605 /701 /703/705/801 /803/805 Engine 646.982 in model 639.601 /603 /605 /701 /703 /705	
9	Remove air filter housing (5).		
10	Remove air intake pipe (6) with resonance body (7)	i For this step separate connector of hot film mass air flow sensor (HFM) and unscrew air intake pipe at cylinder head cover. i The air intake pipe is attached to the rear of the intake manifold with a plastic strap. i Do not damage the plastic strap. Engines 112.942/970 Engines 113.942/965/981	 **AR07.07-P-1454A** **AR07.07-P-1454MV**
⚠ Danger! 11	**Risk of explosion** caused by fuel igniting, **risk of poisoning** caused by inhaling and swallowing fuel as well as **risk of injury** to eyes and skin caused by contact with fuel. Disconnect fuel line at fuel rail	No fire, sparks, open flames or smoking. Pour fuels only into suitable and appropriately marked containers. Wear protective clothing when handling fuel. i Release fuel pressure at service valve. i Collect fuel! i Engine 112: ? ⚠ Danger! i Engine 113: ?	**AS47.00-Z-0001-01A** ***BA07.52-P-1001-01A**

		⚠ Danger! Pressure hose	***BA07.52-P-1001-01A** **Fig. 52**
12	Remove right and left ignition coils (12)		**AR15.12-P-2003A**
13	Remove right and left cylinder head covers (13)		**AR01.20-P-5014B**
14	Remove intake manifold (14)	**Installation:** On vehicles with engine damage, the intake manifold must be examined for swarfs before assembling and any swarfs present must be removed, in order to avoid consequential damage. ℹ The intake manifold system must not be disassembled. ℹ Remove intake manifold together with fuel distributor.	**AR09.20-P-1310A**
15.1	Remove camshaft angle position sensor (15)	ℹ Only necessary if right cylinder head is removed.	**AR15.10-P-2000A**
16	Remove poly-V-belt (8)	ℹ **Installation:** Lock tensioning device with a drift or pin (diameter 5 mm). Models 163.154/157/172. Models 163.174/175.	**AR13.22-P-1202B** **AR13.22-P-1202BA**
17	Detach coolant line (16) at left cylinder head	ℹ 6 mm socket hexagon ℹ 7 mm socket hexagon	***WH58.30-Z-1001-06A** ***WH58.30-Z-1002-06A**
18.1	Remove inner fender (9)	ℹ Only for engine 113.942 /965 /981.	**AR88.10-P-1300GH**
19.1	Remove shield (10)	ℹ Only for engine 113.942 /965 /981.	
20.1	Remove exhaust bracket (11)	ℹ Only for engine 113.942 /965 /981. ℹ Support exhaust system.	
21	Detach exhaust system at exhaust manifold	**Installation:** On vehicles with engine damage check exhaust system for chips before assembly and remove any chips present to prevent later damage ⚠ Danger!	***BA14.10-P-1002-01B**
22	Position crankshaft to 40° after ignition	The engine must not be turned back; otherwise the timing chain can get jammed.	**AR05.10-P-6858V**

	TDC on first cylinder	Rotate engine at crankshaft in direction of rotation until 40° marking on belt pulley/ vibration damper is aligned with marking on timing case cover. The grooves on the camshafts must be pointing toward the inner V.	
23	Lock camshafts with locating plate	Locating plate Locating plate	**Fig. 85** **Fig. 86**
24	Remove chain tensioner (17)	Model 163.154 /157 with Engine 112.942 /970, model 163.172 with Engine 113.942. Model 163.174/175 with Engine 113.981 /965.	**AR05.10-P-7800C** **AR05.10-P-7800CA**
25.1	Remove oil filter housing (18) with oil/water heat exchanger	Engine 113.942. Engines 113.965/981.	**AR18.20-P-3471B** **AR18.20-P-3471BA**
26	Remove camshaft sprockets (19)	If the camshaft sprockets are removed, the engine must no longer be cranked otherwise the timing chain might jam. Engines 113.942 /965/981: ? Tie timing chain tight on both camshaft sprockets with cable straps. Engine 112.942 /970: ? Right-hand camshaft sprocket: Tie timing chain tight on camshaft sprocket with cable strap. Left-hand camshaft sprocket: Mark camshaft sprocket to timing chain and remove camshaft sprocket. It is not possible for the timing chain to jump across at the crankshaft and balancing shaft. After installation: ? Inspect basic position of camshafts. If necessary after checking: ? Set the basic position of camshafts. Open-end wrench Insertion tool Torque wrench Danger!	**AR05.10-P-6858V** **AR05.20-P-6020AU** **Fig. 87** **Fig. 88** **Fig. 92** ***BA05.20-P-1001-01B**
27	Remove camshaft bearing bridges (28)	Observe slackening and tightening pattern!	**AR05.20-P-7103AU**

28	Unscrew bolts, cylinder head --> timing case cover (20)	Danger!	***BA01.40-P-1002-01C**
29	Slacken cylinder head bolts (21) in stages, unscrew	Slacken cylinder head bolts according to loosening pattern only once the engine has cooled down, in order to avoid that the cylinder head warps. **Installation:** Observe tightening pattern and tightening instructions of cylinder head bolts. Oil thread and head contact surface of cylinder head bolts. Screwdriver insert Screwdriver insert Danger!	**AR01.30-P-5800-09B** **AR01.30-P-5800-07B** **Fig. 72** **Fig. 73** ***BA01.30-P-1001-01D**
30	Remove cylinder head Notes on application of sealant to cylinder head gasket.	**Installation:** On Engine 112/113 observe porous points in the left and right cylinder head. If porous points are present, sealant must be applied to the cylinder head gasket. Engine 112, 113 The sealant must be applied within 10 minutes. Loctite 5900 sealant.	**AH01.30-P-1000-04VA** ***BR00.45-Z-1013-01A**
31	Inspect version of cylinder head gasket Information for assigning the cylinder head gaskets	Assignment of cylinder head gasket Engine 112, 113	**AH01.30-P-1000-06V**
32	Check cylinder head bolts (21)		**AR01.30-P-5800-03B** ***BE01.30-P-1001-04B**
33	Clean sealing surfaces, check for cracks, shrink holes and flatness, clean bolt holes	Pay attention to dowel sleeves (26) for locating the cylinder head. Sealing surfaces of crankcase and cylinder head are provided with an 0.8 mm thick silicone layer during series production. Silicone sealant is applied in the gasket area when carrying out repairs only if shrink holes are present. The sealant must be applied within 10 minutes.	***BR00.45-Z-**

		Loctite 5900 sealant.	**1013-01A**
34	Install in the reverse order		
⚠ Danger! 35	**Risk of accident** caused by vehicle starting off by itself when engine is running. **Risk of injury** caused by contusions and burns during starting procedure or when working near the running engine Run engine and inspect for leaks	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes. Do not grasp hot or rotating parts.	**AS00.00-Z-0005-01A**
36	Inspect cooling system for leaks	[i] Warm up engine to operating temperature and then inspect cooling system or leaks.	**AR20.00-P-1010HA**
37	Read fault memory, erase.	[i] Stored faults which can result from cables being disconnected or from simulation during removal and installation or test work, have to be processed and erased in the fault memories after completing the work: ? Diagnosis Manual Volume 2 Index 0: Connecting and using test equipment.	

Cylinder head/cylinder head bolts

Number	Designation			Engine 112.910/911/ 912/913/914/ 915/916/917/ 920/921/922/ 923/940/941/ 942/943/944/ 945/946/947/ 949/951/953/ 954/955/960/ 961/970/972/ 973/975/976	Engines 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/ 963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/ 986/987/988/ 990/991/992/ 993/995
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	11	11
		Length (L) when new	mm	141.5	141.5
		Length (L)	mm	< or = 144.5	< or = 144.5
		See picture		**AR01.30-P-5800-03B**	**AR01.30-P-5800-03B**

⚠ Danger! **Cylinder head**

Number	Designation			Engine 112.910/911/ 912/913/914/ 915/916/917/ 920/921/922/ 923/940/941/ 942/943/944/ 945/946/947/ 949/951/953/ 954/955/960/ 961/970/972/ 973/975/976	Engines 113.940/941/ 942/943/944/ 948/960/961/ 962/963/965/ 966/967/968/ 969/971/980/ 981/982/984/ 986
BA01.30-P-1001-01D	Bolt, cylinder head to crankcase	Stage 1	Nm	10	10
		Stage 2	Nm	30	30
		Stage 3	Angle °	90	90
		Stage 4	Angle °	90	90

⚠ Danger! **Crankcase, timing case cover, end cover**

Number	Designation		Engine 112 except 112.951/ 976	Engine 112.951/ 976	Engines 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/ 963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/ 986/992/995
BA01.40-P-1002-01C	Bolt, cylinder head to timing case cover	Nm	20	20	20

⚠ Danger! **Camshaft**

Number	Designation			Engine 112 except 112.951/976	Engine 112.951/ 976
BA05.20-P-1001-01B	Bolt, camshaft M12 x 45 sprocket	Stage 1	Nm	50	50
		Stage 2	Angle °	90	90

⚠ Danger! **Camshaft**

		Engines 113.940/941/ 942/943/944/ 948/961/962/

Number	Designation				963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/ 986/992/995
BA05.20-P-1001-01B	Bolt, camshaft sprocket	M12 x 45	Stage 1	Nm	50
			Stage 2	Angle °	90

⚠ Danger! **Fuel rail**

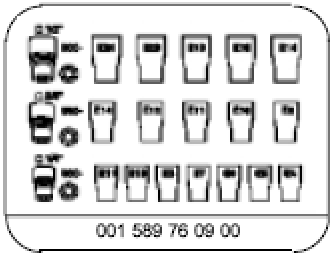
Number	Designation		Engine 112 except 112.945/951/ 960/961
BA07.52-P-1001-01A	Disconnect fuel feed line at fuel rail	Nm	38

⚠ Danger! **Fuel rail**

Number	Designation		Engines 113.940/941/942/943/944/945/946/948/960/961/962/963/964/965/966/967/968/969/9
BA07.52-P-1001-01A	Disconnect fuel feed line at fuel rail	Nm	38

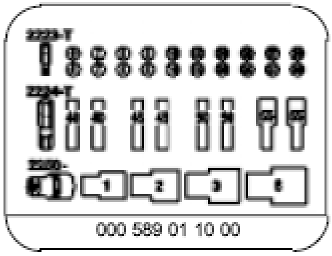
⚠ Danger! **Exhaust manifold**

Number	Designation		Engine 112 except 112.951/ 976	Engines 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/963/964/965/966/967/968/969/971/980/981/982/984/986/992/9
BA14.10-P-1002-01B	Flange connection, exhaust manifold and front exhaust pipes	Nm	20	20



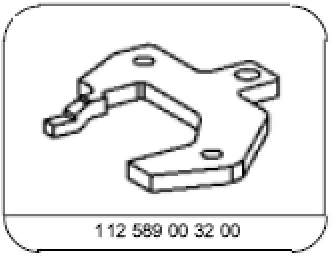
External Torx set

Fig. 83: Identifying External Torx Set (001 589 76 09 00)



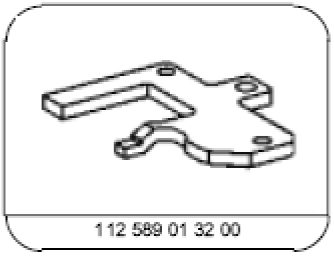
Torx bit set

Fig. 84: Identifying Torx Bit Set (000 589 01 10 00)



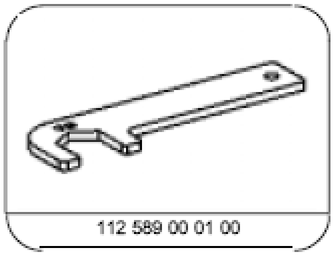
Locating plate

Fig. 85: Identifying Locating Plate (112 589 00 32 00)



Locating plate

Fig. 86: Identifying Locating Plate (112 589 01 32 00)



Open end wrench

Fig. 87: Identifying Open End Wrench (112 589 00 01 00)

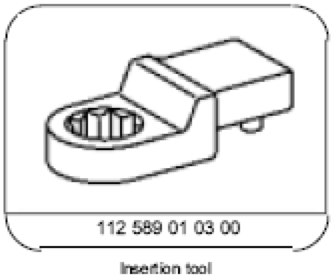


Fig. 88: Identifying Insertion Tool (112 589 01 03 00)

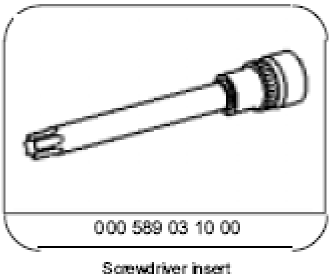


Fig. 89: Identifying Screwdriver Insert (000 589 03 10 00)

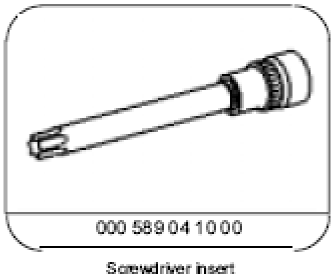


Fig. 90: Identifying Screwdriver Insert (000 589 04 10 00)

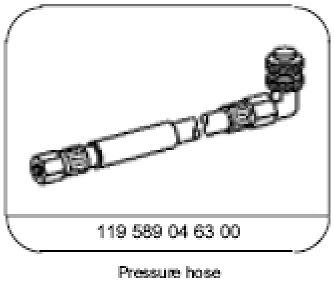


Fig. 91: Identifying Pressure Hose (119 589 04 63 00)

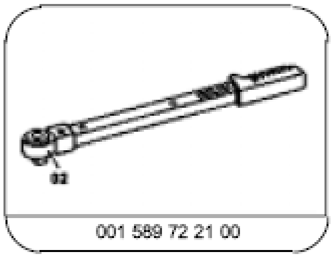


Fig. 92: Identifying Torque Wrench (001 589 72 21 00)

Commercially available tools

Number	Designation
WH58.30-Z-1001-06A	6 mm socket hexagon on flexible shaft for hose clamps with worm drive
WH58.30-Z-1002-06A	7 mm socket hexagon on flexible shaft for hose clamps with worm drive

Repair materials

Number	Designation	Order number
BR00.45-Z-1013-01A	Sealant	A 003 989 98 20

SCREW DIAGRAM FOR TIMING CASE COVER - AR01.40-P-8000-01B

Assignment of bolts for timing case cover

i Apply sealant at the bolts marked (arrows).

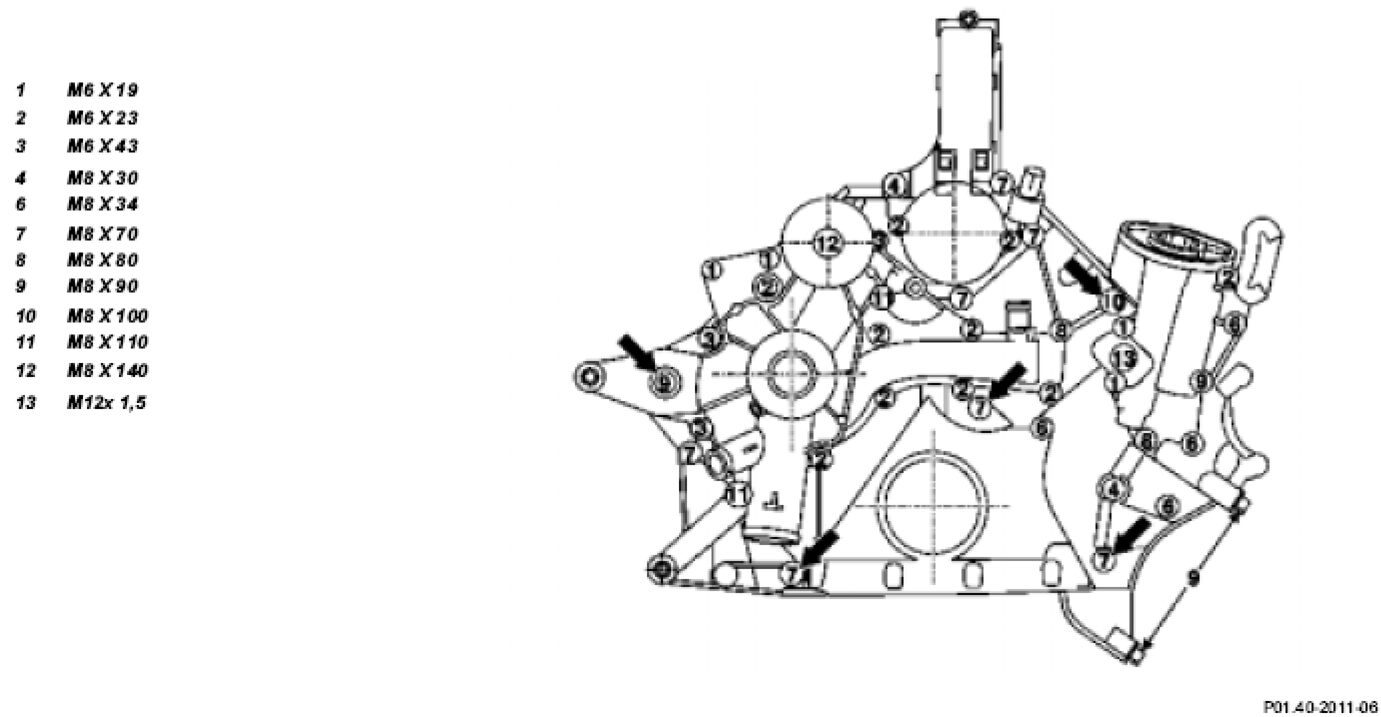


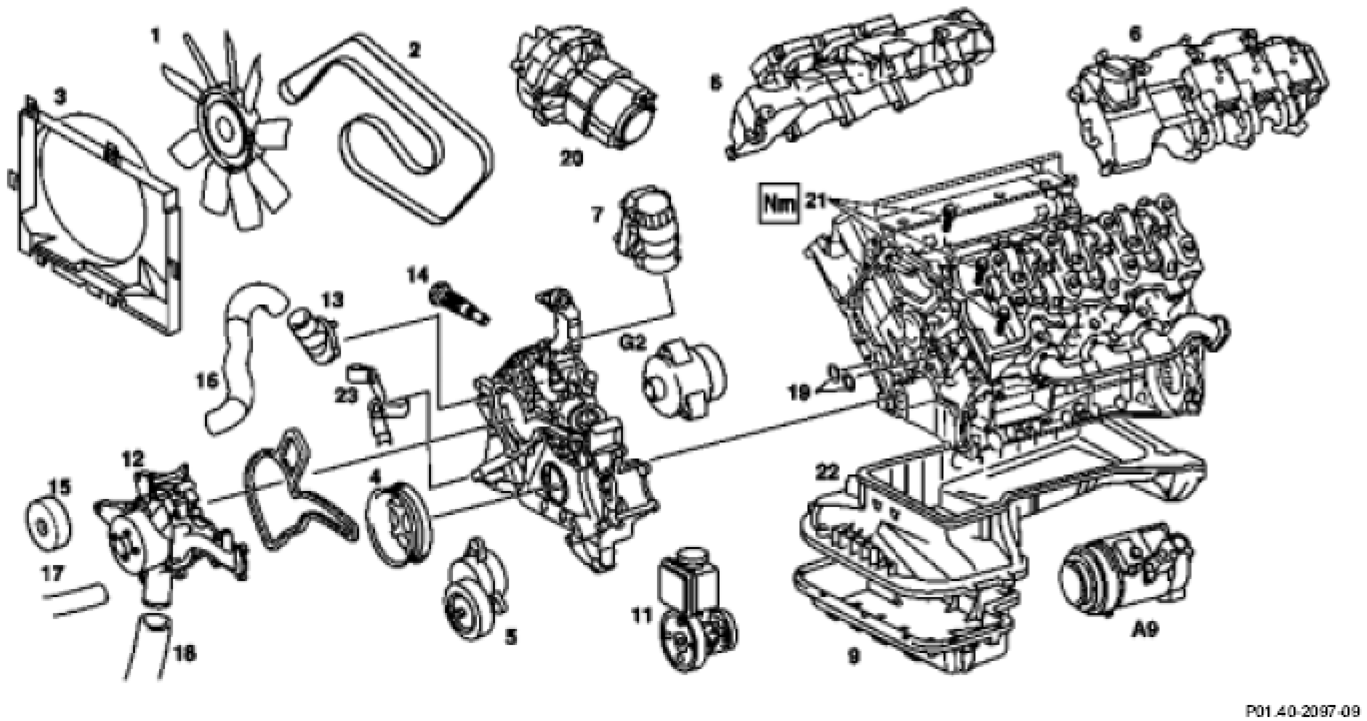
Fig. 93: Identifying Timing Case Cover Bolts & Bolts Needing Sealant

REMOVE/INSTALL TIMING CASE COVER - AR01.40-P-8000B

ENGINE 112 in model 129, 163, 170, 202, 208, 210.061 /063 /065 /261 /263 /265 /663, 220

ENGINE 113 (except 113.991) in MODELS 129,163, 202, 208, 210, 215, 220, 230.475 /474 (except, 215.374,220.074/174)

Shown on engine 112 in model 210



1	*Viscous fan clutch*	9	*Oil pan bottom section*	18	*Coolant line*
2	*Poly-V-belt*	11	*Power steering pump*	19	*Timing case sealing rings*
3	*Fan shroud*	12	*Coolant pump*	20	*Air pump*
4	*Vibration damper*	13	*Thermostat housing*	21	*Bolts*
5	*Poly-V-belt tensioning device*	14	*Chain tensioner*	22	*Oil pan*
6	*Cylinder head covers*	15	*Pulley*	23	*ATF line bracket*
7	*Oil filter housing with oil-water heat exchanger*	16	*Coolant line*	A9	*Refrigerant compressor*
		17	*Coolant line*	G2	*Generator*

Fig. 94: Identifying Timing Case Cover Remove/Install Components - Shown On Engine 112 In Model 210

Modification notes

1.9.04	Value changed from 10 Nm to 14 Nm	Value in row 1003 changed for engine 112.910/911/912/913/914/915/916/917/ 920/921/922/923/940/941/942/943/944/ 945/946/947/949/953/954/955/960/961 / 970/972/973/975	***BA20.10-P-1003-01M**
	Value changed from 10 Nm to 14 Nm	Value in series 1004 changed for engine 112.910/911/912/913/914/915/916/917/ 920/921/922/923/940/941/942/943/944/ 945/946/947/949/953/954/955/960/961 / 970/972/973/975	***BA20.10-P-1004-01M**

	Remove/install		
⚠ Danger!	**Risk of explosion** caused by oxyhydrogen gas. **Risk of**	No fire, sparks, open flames or smoking. Wear acid-resistant gloves, clothing and safety glasses. Only pour battery acid into suitable and appropriately marked containers.	**AS54.10-Z-0001-01A**

	poisoning and caustic burns caused by swallowing battery acid. **Risk of injury** caused by burns to skin and eyes from battery acid or when handling damaged lead-acid batteries		
1	Disconnect battery ground cable	Models 129, 163, 170, 202, 208, 210	**AR54.10-P-0003A**
		Model 215, 220	AR54.10-P-0003I
		Model 230.474 /475	AR54.10-P-0003R
	Notes on battery	All models	**AH54.10-P-0001-01A**
2	Remove engine compartment paneling	Model 129,202,208,210	AR61.20-P-1105AB
		Models 163.172/174/175	**AR61.20-P-1105GH**
		Model 170	AR61.20-P-1105A
		Model 215, 220	AR61.20-P-1105M
		Model 230	AR61.20-P-1105R
Danger!	**Risk of injury** to skin and eyes caused by scalding from contact with hot coolant spray. **Risk of poisoning** from swallowing coolant.	Do not open cooling system unless coolant temperature is below 90°C. Open cap slowly and release the pressure. Do not pour coolant into beverage containers. Wear protective gloves, protective clothing and safety glasses.	**AS20.00-Z-0001-01A**
3	Drain coolant from radiator	Engine 112, 113 in models 129, 163, 202, 208, 210,215,220 Engine 113.963 in models 230.475	**AR20.00-P-1142HA**
		Engine 112.960 in model 170.466	AR20.00-P-1142RVK
		Engine 113.992 in model 230.474	

		Engine 113.963 in models 230.475 Engine 112.947 in model 170.465 Engine 112.960 in model 170.466	 AR20.00-P-1142SV
4.1	Remove engine cover with integrated air filter	Model 129 Type 170.465 Model 202.033/ 093 Model 208.370 /374 /470 Model 220 Type 230.475 [i] Unclip covering on front side of engine. Remove the engine cover with integrated air filter from the cylinder head covers vertically in the upward direction.	
4.2	Remove air filter	Engine 112.960 in model 170.466 Engine 113.992 in model 230.474	AR09.10-P-1150SVK
5.1	Remove viscous fan clutch (1)	Engine 112 in model 210, 202, 129 Engine 112 in model 163.154 /157 Engine 113 in model 210, 208, 202, 129 Engine 113 in model 163.172 [i] Right-hand thread!	**AR20.40-P-5660C**
6.1	Remove heater unit	Model 170.465 with retrofitted stationary heater Thermo Top C.	AR83.70-P-5302NB
7.1	Remove fan shroud (3)	Engine 113 in model 215 Engine 112 in model 220 Engine 113 in model 220 Engine 113.963 in models 230.475 Engine 113.992 in model 230.474	AR20.40-P-6800AB
7.2	Remove electric fan	[i] Model 163 unscrew bolts at bottom of fan shroud. Engine 113.965 in model 163.175 Engine 113.981 in model 163.174 Engine 112.947 in model 170.465 Engine 112.960 in model 170.466	 **AR20.40-P-5000GH** AR20.40-P-5000SV
8	Attach guard plate for radiator / condenser		
☞ WF	Guard plate for radiator / condenser	Engines 112, 113, 137, 271, 272, 275, 285, 602, 604, 605, 606, 611, 612, 613, 628, 648	WF58.50-P-0110-01A
9.1	Remove poly-V-belt for supercharger	Engine 113.992 in model 230.474	AR13.21-P-1202RVK
9.2	Remove poly V-belt (2)	ENGINE 112 in models 129, 163	**AR13.22-P-1202B**

		Engine 113 in model 129, 202, 208, 210 Engine 113 (except 113.965 /981) in model 163 Engine 112 in model 202, 208, 210 Engine 112 in model 220 Engine 113 in model 215.373 /375 Engine 113 in models 220.070 /073 /075 /083 /084 /170 /173 /175 /183 /184 /875 Engine 113.965 in model 163.175 Engine 113.981 in model 163.174 Engine 113.984 in model 208.374 /474	**AR13.22-P-1202BA**
		Engine 113.963 in models 230.475 Engine 113.992 in model 230.474	AR13.22-P-1202R
		Engine 112.947 in model 170.465	AR13.22-P-1202SV
10	Remove cylinder head covers (6)	Engine 112, 113 air filter located on vehicle side	**AR01.20-P-5014B**
		Engine 112, 113 air filter located on engine side	**AR01.20-P-5014BV**
11	Detach coolant line (17, 18) from coolant pump (12).		
12	Detach coolant line (16) at thermostat housing (13).		
13	Dismount refrigerant compressor (A9)	[i] Place to the side with lines connected. ⚠ Danger!	***BA83.55-P-1001-01A**
14.1	Remove alternator (G2)	Engine 113.963 in models 230.475 Engine 113.992 in model 230.474	AR15.40-P-5032R
15.1	Remove ATF line bracket (23).	Model 230	
15.2	Detach ATF line from front axle carrier	Model 163	
16	Remove oil pan bottom section (9)	Engine 112.942 in model 163.154 Engine 112.970 in model 163.157 Engine 113.942 in model 163.172	**AR01.45-P-7555V**
		Engine 113.965 in model 163.175	**AR01.45-P-7555VE**

		Engine 113.981 in model 163.174	
		Engine 112 in models 210, 208, 202, 170, 129, engine 113 in model 210, 208, 202, 129	AR01.45-P-7555VA
		Engine 112 (except 112.975) in model 220	
		Engine 113 (except 113.948 /966) in model 220	
		Engine 112.975 in model 220	AR01.45-P-7555IW
		Engines 113.948/ 966 in model 220	
		Engine 113.963 in models 230.475	AR01.45-P-7555R
		Engine 113.992 in model 230.474	
17.1	Remove oil pump	Engine 112, 113 in model 163	**AR18.10-P-6020B**
18.1	Remove oil pan (22)	Engine 112, 113 in model 129	AR01.45-P-7500FD
		Engine 112.942 in model 163.154	**AR01.45-P-7500FB**
		Engine 112.970 in model 163.157	
		Engine 113.942 in model 163.172	
		Engine 113.965 in model 163.175	
		Engine 113.981 in model 163.174	
		Engine 112.947 in model 170.465 with transmission 722.6	AR01.45-P-7500SV
		Engine 112.960 in model 170.466 with transmission 722.6	
		Engine 112 in model 202, 208	AR01.45-P-7500FC
		Engine 113 in model 208	
		Engine 113.944 in model 202.033 /093	
		Engine 112 in models 210.06 /26 /66	AR01.45-P-7500F
		Engine 113 in model 210	
		Engine 112 (except 112.975) in model 220	AR01.45-P-7500I
		Engine 113 (except 113.948 /966) in model 220	
		Engine 112.975 in model 220	AR01.45-P-7500IW
		Engines 113.948/ 966 in model 220	
		Engine 113.963 in models 230.475	AR01.45-P-7500R
		Engine 113.992 in model 230.474	
19.1	Remove tensioning device for compressor poly-V-belt	Engine 113.992 in model 230.474	AR13.25-P-3217RVK

20	Remove poly-V-belt tensioning device (5)	Engine 112 in models 129, 163 Engine 113 in model 129, 202, 208, 210 Engine 113 (except 113.965 /981) in model 163 i Models 129, 202, 210 with manual transmission. Unscrew damper of belt tensioning device at coolant pump.	**AR13.25-P-3200B**
		Engine 113.963 in models 230.475 Engine 113.992 in model 230.474	AR13.25-P-3200R
21	Remove vibration damper (4)	Engine 112 in models 129, 163 Engine 113 in models 129, 202.033 /093 Engine 113 (except 113.981) in model 163 Engine 113 (except 113.980) in model 210 Engine 113 (except 113.984) in model 208	**AR03.30-P-1600C**
		Engine 112.947 in model 170 Engine 112 in model 202, 208, 210, 220 Engine 113.981 in model 163.174 Engine 113 (except 113.991) in models 215, 220. Engine 113.963 in models 230.475	**AR03.30-P-1600CA**
		Engine 113.992 in model 230.474	AR03.30-P-1600RVK
22	Remove chain tensioner (14)	ENGINE 112 in models 129, 163 Engine 113 (except 113.965 /981) in model 163 Engine 113 in model 129, 202, 208, 210	**AR05.10-P-7800C**
		Engine 112 in model 170, 202, 208, 210 Engine 113 in model 163.174 /175	**AR05.10-P-7800CA**
		Engine 112 in model 220 Engine 113 in model 215.373 /375 Engine 113 in models 220.070 /073 /075 /083 /084 /170 /173 /175 /183 /184 /875 Engine 113 in model 230.474 /475	AR05.10-P-7800AM
23.1	Remove oil filter housing	Engine 113.992 in model 230.474	AR18.20-P-3471RKV
23.2	Remove oil filter housing with oil/water heat exchanger (7)	Engine 112 in models 170, 202, 208, 210, 220 Engine 113 in model 220 Engine 113.963 in models 230.475 Engine 113.965 in model 163.175 Engine 113.981 in model 163.174	**AR18.20-P-3471BA**
		Engine 112 in models 129, 163	**AR18.20-P-3471B**

		Engine 113 in model 129, 202, 208, 210 Engine 113 (except 113.965/981) in model 163	
24.1	Remove oil reservoir on power steering pump (11)	Model 163 i **Removal:** Extract oil from reservoir. Remove circlip. i **Installation:** Replace sealing ring. Check that circlip is correctly seated.	
AP	Power steering - checking and correcting oil level	Hand pump	AP46.00-P-4611BB **Fig. 95**
24.2	Detach power steering pump (11) with oil reservoir.	i Do not disconnect lines. Danger! Danger! Danger!	***BA46.30-P-1005-01A** ***BA46.30-P-1010-01A** ***BA46.30-P-1010-01C**
25.1	Detach guide pulley at timing case cover	Model 230.474 Danger!	***BA13.25-P-1008-01D**
25.2	Take off guide pulley (15) at coolant pump	i Except model 230.474 Take plastic cover off guide pulley. Danger! Danger!	***BA20.10-P-1001-01C** ***BA20.10-P-1001-01M**
26.1	Remove compressor	Engine 112.960 in model 170.466 Engine 113.992 in model 230.474	AR09.50-P-4705SVK
27	Remove air pump (20)	Engine 112 (except 112.960) in model 170 Engine 112 in 163, 202, 208, 210 Engines 113 in 163, 202, 208, 210 Engine 112.922 in model 220.063 Engine 112.923 in model 129.059 Engine 112.943 in model 129.064 Engine 112.944 in model 220.065 /165 Engine 112.972 in model 220.067 /167 Engine 112.975 in model 220.087 /187 Engine 113.941 in models 220.070/170 Engine 113.948 in model 220.083 /183 Engine 113.960 in model 220.075/175 Engine 113.960 in model 215.375 Engine 113.961 in model 129.068 Engine 113.963 in models 230.475 Engine 113.966 in model 220.084 /184	**AR14.30-P-7251A** AR14.30-P-7251AA

		Engine 113.992 in model 230.474	AR14.30-P-7251RVK
28	Separate electrical line from coolant temperature sensor		
29	Unscrew bolts (21) of cylinder head to timing case cover on right and left	⚠ Danger!	***BA01.40-P-1002-01C**
30	Remove screws of the timing case cover	[i] **Installation:** Apply sealant to marked bolts, observing the bolt diagram for the timing case cover: ? Bolt diagram for timing case cover engine 112, 113 Bolt diagram for timing case cover engine 113.992, ⚠ Danger! ⚠ Danger!	***BR00.45-Z-1015-01A** **AR01.40-P-8000-01B** AR01.40-P-8000-01RVK ***BA01.40-P-1001-01C** ***BA01.40-P-1002-01C**
31	Take off timing case cover	[i] **Installation:** The bolt threads for the coolant pump, the belt tensioning device, and the power steering pump are not cut into a new timing case cover. For this reason, use new self-tapping bolts in combination with a new timing case cover for attaching the coolant pump, the belt tensioning device and the power steering pump. Pay attention to tightening torque with non-pre-tapped threads. ⚠ Danger! ⚠ Danger! ⚠ Danger! ⚠ Danger! ⚠ Danger! ⚠ Danger! ⚠ Danger! ⚠ Danger! ⚠ Danger!	***BA13.25-P-1001-01D** ***BA13.25-P-1001-01M** ***BA13.25-P-1005-01D** ***BA13.25-P-1006-01D** ***BA13.25-P-1007-01D** ***BA20.10-P-1001-01C** ***BA20.10-P-1001-01M** ***BA20.10-P-1002-01C** ***BA20.10-P-**

		⚠ Danger! ⚠ Danger! ⚠ Danger! ⚠ Danger! ⚠ Danger! ⚠ Danger! Clean sealing surfaces, apply sealant only to specified surfaces in form of bead with height and width of 2.0 mm ± 0.5 mm. The sealant must be applied within 10 minutes! The silicone bead must not be spread!	**1002-01M** ***BA20.10-P-1003-01C** ***BA20.10-P-1003-01M** ***BA20.10-P-1004-01C** ***BA20.10-P-1004-01M** ***BA46.30-P-1010-01A** ***BA46.30-P-1010-01C** ***BR00.45-Z-1013-01A**
	Notes on application of sealant to timing case cover		**AH01.40-P-1000-01B**
		Installation: If sealing compound enters the oil ducts, this is carried by the oil flow and will clog the oil supply bores. ○ Do not damage cylinder head gasket. ○ Replace seals on timing case (19). ○ Replace front crankshaft radial sealing ring: ? Engine 112 in model 129 Engine 113 in model 129 Engine 113 in model 163, 202, 208, 210	**AR03.20-P-3000B**
		Engine 112 in models 170, 202, 208, 210, 220 Engine 113 in model 215, 220 Engine 113.981 in model 163.174 Engine 113.963 in models 230.475 Engine 113.992 in model 230.474	**AR03.20-P-3000BA**
32	Install in the reverse order		
⚠ Danger!	**Risk of accident** caused by vehicle starting off by itself when engine is running. **Risk of injury** caused by contusions and burns during starting procedure	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes. Do not grasp hot or rotating parts.	**AS00.00-Z-0005-01A**

	or when working near the running engine		
33	Run engine and inspect for leaks		
34	Inspect cooling system for leaks	First warm up engine to operating temperature. Engine 112 (except 112.947 /960) Engine 113 (except 113.992 /963) Engine 112 in Model 170	**AR20.00-P-1010HA** AR20.00-P-1010P
35	Perform basic programming	Model 215, 220 All except model 215, 220: Code radio and normalize power window. Vehicles with stationary heater: adjust time display on stationary heater.	AR00.19-P-0200M
36.1	Read out fault memory and erase	All except models 215, 220, 230 [i] Stored faults which can result from cables being disconnected or from simulation during removal and installation or test work, have to be processed and erased in the fault memories after completing the work: ? Diagnosis Manual Volume 2 Index 0: Connecting and using test equipment.	
36.2	Read out fault memory with STAR DIAGNOSIS and erase if necessary.	Model 220, 230	
AD	Connect STAR DIAGNOSIS and read out fault memory		**AD00.00-P-2000-04A**
		STAR DIAGNOSIS diagnosis system [i] Stored faults which can result from removal and installation or test work, have to be processed and erased in the fault memories after completing the work.	***WH58.30-Z-1048-13A**

Danger! **Crankcase, timing case cover, end cover**

Number	Designation		Engine 112 except 112.951/976	Engine 112.951/976	Engine 113.987/988/990/991/993
BA01.40-P-1001-01C	Timing case cover to crankcase	Nm	20	20	20
BA01.40-P-	Bolt, cylinder	Nm	20	20	20

1002-01C	head to timing case cover			

⚠ Danger! Crankcase, timing case cover, end cover

Number	**Designation**		**Engines 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/ 963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/ 986/992/995**	**Engine 113.987/ 988/990/ 991/993**
BA01.40-P-1001-01C	Timing case cover to crankcase	Nm	20	20
BA01.40-P-1002-01C	Bolt, cylinder head to timing case cover	Nm	20	20

⚠ Danger! Belt tensioning device

Number	**Designation**			**Engine 112.910/911/91 2/913/914/915/ 916/917/920/ 921/922/923/ 940/941/942/ 943/944/945/ 946/947/949/ 953/954/955/ 960/961/970/ 972/973/975**
BA13.25-P-1001-01M	Self-tapping bolt of belt tensioner to timing case cover	Thread not pre-tapped	Nm	35
		Thread pre-tapped	Nm	25

⚠ Danger! Belt tensioning device

		Engine 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/ 963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/	**Engine 113.990/ 991/992/**

Number	Designation			986/987/988	993/995
BA13.25-P-1001-01D	Self-tapping bolt of belt tensioner to timing case cover	Thread not pre-tapped	Nm	35	35
		Thread pre-tapped	Nm	25	25
BA13.25-P-1005-01D	Bolt of belt tensioner to timing case cover	M7 x 25	Nm	35	35
BA13.25-P-1006-01D	Self-tapping bolt of compressor belt tensioner to timing case cover	Thread not pre-tapped	Nm	-	35
		Thread pre-tapped	Nm	-	25
BA13.25-P-1007-01D	Bracket for charge air cooler water pipes		Nm	7	14
BA13.25-P-1008-01D	Bolt of guide pulley for compressor and major assembly belts to timing case cover	M8x78	Nm	-	68

Danger! Coolant pump, coolant thermostat

Number	Designation				Engine 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/ 963/965/966/ 967/968/969/ 980/981/982/ 984/986/992 993/995
BA20.10-P-1001-01C	Self-tapping screw for coolant pump to timing case	Thread not pre-tapped	M6	Nm	14
		Thread not pre-tapped	M8	Nm	35
		Thread pre-tapped	M6	Nm	10
		Thread pre-tapped	M8	Nm	25
BA20.10-P-1002-01C	Belt pulley to coolant pump			Nm	10
BA20.10-P-	Bolt, coolant thermostat housing		M6	Nm	10

1003-01C				
BA20.10-P-1004-01C	Coolant pump at the timing case	M7	Nm	10

⚠ Danger! **Coolant pump, coolant thermostat**

Number	Designation				Engine 112.910/911/912/913/914/915/916/917/920/921/922/923/940/941/942/943/944/945/946/947/949/953/954/955/960/961/970/972/973/975
BA20.10-P-1001-01M	Self-tapping screw for coolant pump to timing case	Thread not pre-tapped	M6	Nm	14
		Thread not pre-tapped	M8	Nm	35
		Thread pre-tapped	M6	Nm	10
		Thread pre-tapped	M8	Nm	25
BA20.10-P-1002-01M	Belt pulley to coolant pump			Nm	9
BA20.10-P-1003-01M	Bolt, coolant thermostat housing		M6	Nm	14
BA20.10-P-1004-01M	Coolant pump at the timing case		M7	Nm	14

⚠ Danger! **Power steering pump**

Number	Designation		Model 170
BA46.30-P-1005-01A	Screw, power steering pump to cylinder liner collar seat or crankcase	Nm	25

⚠ Danger! **Power steering pump**

		Model 208.365/370/	Models 210.061/063/065/070/074/081/082/083/261/263/265/270/274/281/282/283/

Number	Designation			374/465/470	663
BA46.30-P-1010-01A	Self-tapping bolt, power steering pump to timing case	Thread not pre-tapped	Nm	35	35
		Thread pre-tapped	Nm	20	20

⚠ Danger! **Power steering pump**

Number	Designation			Model 202.026/029/ 033/086/089/093	Model 129.059/ 064/068
BA46.30-P-1010-01A	Self-tapping bolt, power steering pump to timing case	Thread not pre-tapped	Nm	35	35
		Thread pre-tapped	Nm	20	20

⚠ Danger! **Power steering pump**

Number	Designation			Model 215.374/ 375/378/ 379	Model 220.083/084/08 7/183/184/187
BA46.30-P-1010-01C	Self-tapping bolt, power steering pump to timing case	Thread not pre-tapped	Nm	35	35
		Thread pre-tapped	Nm	20	20

⚠ Danger! **Power steering pump**

Number	Designation			Models 220.063/065/ 070/073/075/ 165/170/173/ 175 without code 487a	Model 230 without code 487	Model 230 with code 487
BA46.30-P-1010-01C	Self-tapping bolt, power steering pump to timing case	Thread not pre-tapped	Nm	35	35	35
		Thread pre-tapped	Nm	20	20	20

⚠ Danger! **Refrigerant compressor**

Number	Designation		Engine 112.910/911/ 920/921/940/941, 113.940/943/944/980 /984 in model 202, 208, 210	Engine 112.923/943, 113.961 in model 129
BA83.55-P-1001-01A	Bolt, refrigerant compressor to bracket	Nm	20	20

⚠ Danger! Refrigerant compressor

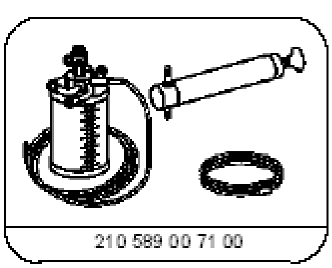
Number	Designation	Engine 111.977,112.942, 112.970,113.942 / 965/981 in model 163	Engine 112.947/960 in model 170
BA83.55-P-1001-01A	Bolt, refrigerant compressor to bracket Nm	20	20

⚠ Danger! Refrigerant compressor

Number	Designation	Engines 112.922/944 in model 220	Engine 113.960 in model 215
BA83.55-P-1001-01A	Bolt, refrigerant compressor to bracket Nm	20	20

⚠ Danger! Refrigerant compressor

Number	Designation	Engine 113.941/960 in model 220	Engine 113.963/992/995 in model 230
BA83.55-P-1001-01A	Bolt, refrigerant compressor to bracket Nm	20	20



Hand pump

Fig. 95: Identifying Hand Pump (210 589 00 71 00)

Commercially available tools

Number	Designation
WH58.30-Z-1048-13A	STAR DIAGNOSIS diagnosis system, Compact Passenger Car 6511 1801 00

Repair materials

Number	Designation	Order number
BR00.45-Z-1013-01A	Sealant	A 003 989 98 20

BR00.45-Z-1015-01A	Sealant	A 002 989 71 20

REMOVE/INSTALL THE END COVER - AR01.40-P-8913B

ENGINE 1123.945 in MODEL 463.209 /232 /233 /244 /245 /250

ENGINE 112 in MODEL 129, 163, 170, 202, 203, 208, 209, 210, 220

ENGINE 113.962 in MODEL 463.206 /240 /241 /247 /248 /249 /254

ENGINE 113 in MODEL 129, 163, 202, 208, 209, 210, 220, 230.474 /475

ENGINE 112.913 in MODEL 211.061/261

ENGINE 112.949 in MODEL 211.065 /265

ENGINE 113.967 in MODEL 211.070 /270

ENGINE 113.982 in MODEL 463.243 /246

ENGINE 112.917 in MODEL 211.080 /280

ENGINE 112.954 in MODEL 211.082 /282

ENGINE 113.969 in MODEL 211.083 /283

Shown on engine 112

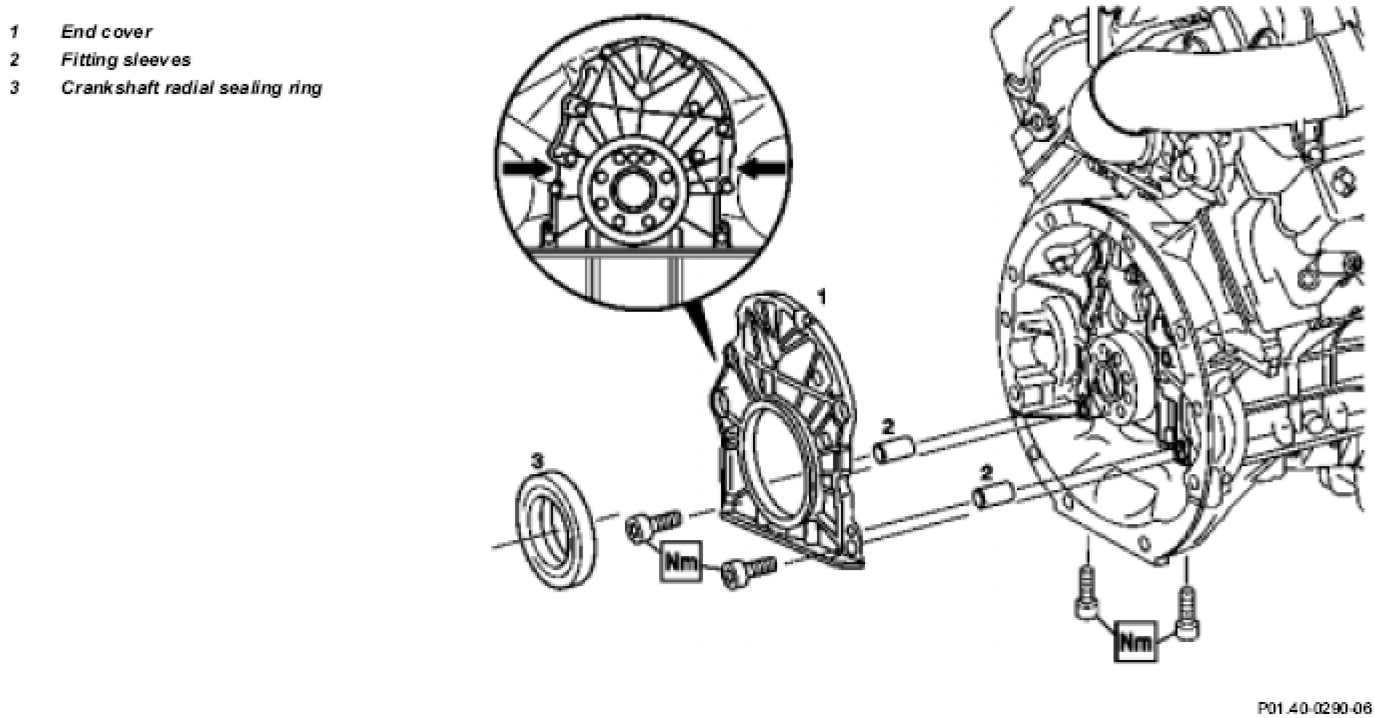


Fig. 96: Identifying End Cover Remove/Install Components - Shown On Engine 112

	Remove/install		
1	Remove flywheel/drive plate		**AR03.30-P-8001C**
2	Remove the end cover (1).	Pry off end cover (1) carefully at both marked points with a slanted screwdriver (see magnified section). The crankshaft radial sealing ring (3) must always be replaced when end cover (1) is removed. Danger!	***BA01.40-P-1004-01C**
3	Install a new rear crankshaft radial seal (3)	The rear crankshaft radial sealing ring (3) must only be removed once end cover (1) has been removed. **Installation:** Circumference and lip of the crankshaft radial sealing ring (3) as well as the counter tread on the	

		crankshaft must be free of oil and grease, in order to guarantee a proper function.	
		Install crankshaft radial seal (3)	**AR03.20-P-3063-01B**
		⛶	**Fig. 97**
		[i] **Installation:** Pay attention to fitted sleeves (2) when pressing on end cover!	
[i]	Notes on application of sealant to end cover with radial shaft seal	Sealant	**AH01.40-P-1000-06A** ***BR00.45-Z-1013-01A**
4	Install in the reverse order		
⚠ Danger!	**Risk of accident** caused by vehicle starting off by itself when engine is running. **Risk of injury** caused by contusions and burns during starting procedure or when working near the engine as it is running	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes. Do not touch hot or rotating parts. [i]	**AS00.00-Z-0005-01A**
5	Carry out engine test run	[i] Before installing transmission, inspect for oil leaks	

⚠ Danger! **Crankcase, timing case cover, end cover**

Number	**Designation**			**Engine 112 except 112.951/ 976**
BA01.40-P-1004-01C	End cover screw	Thread not pre-tapped	Nm	14
		Thread pre-tapped		10

⚠ Danger! **Crankcase, timing case cover, end cover**

		Engine 113.940/941/ 942/943/944/ 945/946/948/ 960/961/962/ 963/964/965/ 966/967/968/ 969/971/980/ 981/982/984/	**Engine 113.987/ 988/990/**

Number	**Designation**			**986/992/995**	**991/993**
BA01.40-P-1004-01C	End cover screw	Thread not pretapped	Nm	-	-
		Thread pre-tapped	Nm	10	8

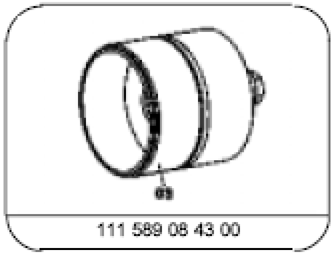


Fig. 97: Identifying Installation Tool (111 589 08 43 00)

Repair materials

Number	Designation	Order number
BR00.45-Z-1013-01A	Sealant	A 003 989 98 20

CHAMFER CYLINDER BORES - AR01.40-P-9201-01A

1. Chamfer off the burr which has accumulated on the cylinder bores after drilling out using a suitable tool (e.g. hand milling cutter).

[i] Equalize the bottom edge of chamfer with a polishing stone.

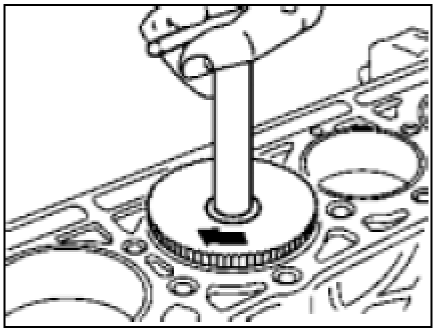


Fig. 98: Removing Chamfer Burr From Cylinder Bore

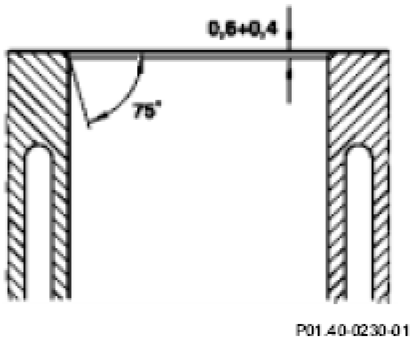


Fig. 99: Identifying Chamfer Angle Of Cylinder Bore

MEASURING, BORING AND HONING CYLINDER BORES - AR01.40-P-9201AA

ENGINES 112.910/911 /912 /920 /921 /922 /923 /940 /941 /942 /943 /944 /945 /946 /947 /960 /961 /970

ENGINES 113.940 /941 /942 /943 /960 /961 /962 /963 /965 /968 /981 /982 /990 /991 /992 /993 /995

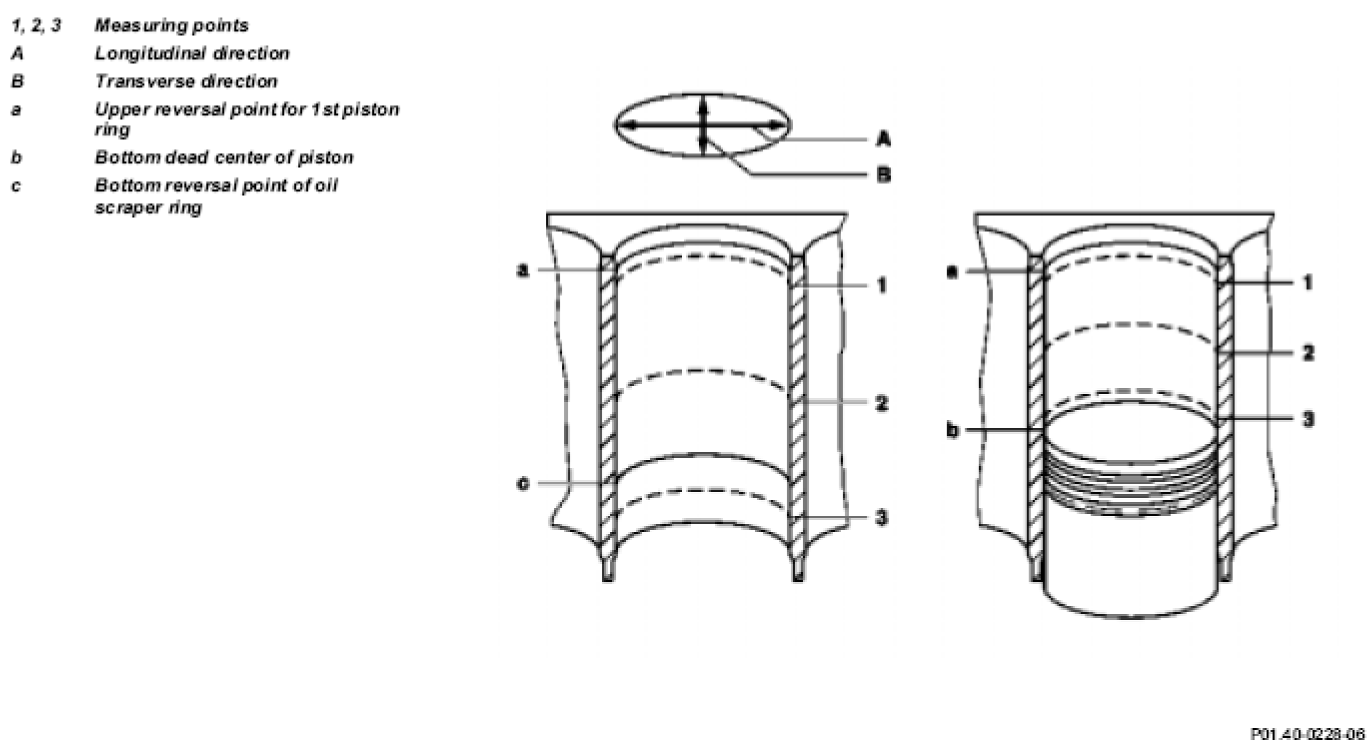


Fig. 100: Identifying Measuring Points Of Cylinder Bore

1	**Clean cylinder bores**		
2	Measure cylinder bore	i Measure cylinder bores with an internal measuring instrument at 3 measuring points (1, 2, 3) in a	

		longitudinal direction (A) and transverse direction (B). Cylinder diameter Cylinder bore Cylinder length Undercut [i] Internal measuring instrument ø 50 to 150 mm, with 0.01 mm indication and measuring point pressure relief [i] Setting micrometer for internal measuring instrument GRM 2125 with setting range 50 to 200 mm	 ***BE01.40-P-1001-01F** ***BE01.40-P-1001-02E** ***BE01.40-P-1004-01F** ***BE01.40-P-1005-01F** ***WE58.40-Z-1003-21A** ***WE58.40-Z-1004-21A**
3	Set honing machine for pre-honing	Cylinder diameter setting for repair size (+0.25) Stroke setting with 70 mm stone length on 70th stroke scale of machine Stone overrun at top and bottom Engine speed Feed Stroke Display [i] Automatic cylinder repair machine [i] Set of stones for rough honing C 30-A 53, or C30 J64, 70 mm long	***BE01.40-P-1002-01F** ***BE01.40-P-1006-01F** ***BE01.40-P-1007-01F** ***BE01.40-P-1008-01F** ***BE01.40-P-1009-01F** ***BE01.40-P-1010-01F** ***BE01.40-P-1011-01F** ***WE58.40-Z-1002-21A** ***WH58.30-Z-1031-04A**
4	Cylinder bore pre-honing	[i] With full honing oil feed.	
5	Measure cylinder bore	[i] Immediately after pre-honing, the measurement deviates by approx. +0.02 mm due to heat expansion. [i] Internal measuring instrument ø 50 to 150 mm, with 0.01 mm indication and measuring	***BE01.40-P-1003-01F** ***WE58.40-Z-1003-21A**

		point pressure relief	
6	Set honing machine for precision honing	Cylinder diameter setting for repair size (+0.25)	***BE01.40-P-1002-01F**
		Stroke setting with 70 mm stone length on 70th stroke scale of machine	***BE01.40-P-1006-01F**
		Stone overrun at top and bottom	***BE01.40-P-1007-01F**
		Engine speed	***BE01.40-P-1008-01F**
		Feed	***BE01.40-P-1009-01F**
		Stroke	***BE01.40-P-1010-01F**
		Display	***BE01.40-P-1011-01F**
		i Finish-honing, stone set C 30-J 84, 70 mm long	***WH58.30-Z-1032-04A**
7	Cylinder bore precision honing	i With full honing oil feed.	
8	Measure cylinder bore	i Immediately after precision honing, an oversize of approx. +0.01 mm is obtained because of heating.	***BE01.40-P-1003-01F**
		i Internal measuring instrument ø 50 to 150 mm, with 0.01 mm indication and measuring point pressure relief	***WE58.40-Z-1003-21A**
9.1	Chamfer cylinder bore	i Except engines 112.945, 113.962 /982 in model 463.	**AR01.40-P-9201-01A**
10	Set honing machine for polishing	Cylinder diameter setting for repair size (+0.25)	***BE01.40-P-1002-01F**
		Stroke setting with 70 mm stone length on 70th stroke scale of machine	***BE01.40-P-1006-01F**
		Stone overrun at top and bottom	***BE01.40-P-1007-01F**
		Engine speed	***BE01.40-P-1008-01F**
		Feed	***BE01.40-P-1009-01F**
		Stroke	***BE01.40-P-1010-01F**
		Display	***BE01.40-P-1011-01F**
		i Set of stones for polishing C 30-C 03-81, 70 mm long	***WH58.30-Z-1033-04A**
11	Polish cylinder bore	i Polish with full honing	***BE01.40-P-1003-01F**

		oil feed up to final repair size.	
12	Measure cylinder bore	i Allow crankcase to cool down to approx. 20°C before measuring Cylinder diameter i Internal measuring instrument ø 50 to 150 mm, with 0.01 mm indication and measuring point pressure relief	 ***BE01.40-P-1001-01F** ***WE58.40-Z-1003-21A**
13	Clean cylinder bore and dry		
14	Set honing machine for lapping	i Set to same diameter as after polishing (final diameter). Cylinder diameter according to machining stage. Stroke setting with 70 mm felt length on 70th stroke scale of machine Felt insert overrun at top and bottom Engine speed Feed Stroke Display i Felt insert C 30-F 85 i Set of felt insert holders CK3130 i Stone holder for felt insert CK-30 35	 ***BE01.40-P-1003-01F** ***BE01.40-P-1012-01F** ***BE01.40-P-1013-01F** ***BE01.40-P-1008-01F** ***BE01.40-P-1009-01F** ***BE01.40-P-1010-01F** ***BE01.40-P-1011-01F** ***WH58.30-Z-1036-04A** ***WH58.30-Z-1035-04A** ***WH58.30-Z-1034-04A**
15	Rub-in cylinder bore and filter insert using honing paste	i Without honing oil feed, the cylinder wall must be dry. Only the specified honing paste may be used. Only this one guarantees the specified final result. Polmot honing paste order no. 600.11	 ***BR00.45-Z-1050-06A**
16	Lap cylinder bore and expose silicone crystals.	i Without honing oil feed.	

		Operating time of honing machine	***BE01.40-P-1014-01F**
17	Coat filter insert again with honing paste	[i] Do not coat cylinder bore with honing paste. Polmot honing paste order no. 600.11	***BR00.45-Z-1050-06A**
18	Lap cylinder bore and expose silicone crystals.	[i] Without honing oil feed, removed material cannot be measured. Operating time of honing machine	***BE01.40-P-1014-01F**
19	Clean cylinder bore and dry	[!] Clean crankcase very carefully with honing paste. If possible, clean crankcase in a major assembly washing machine, so that no cylinder wall damage will be caused by residues when running the engine later.	
20	Inspect cylinder bore	[i] Allow crankcase to cool down to approx. 20°C before inspecting. Cylinder diameter of repair size	***BE01.40-P-1001-01F**

Check values for crankcase

Number	**Designation**			**Engine 112 except 112.951, 113.940/941/ 942/943/944/ 945/946/948/ 960/961/963/ 965/966/967/ 968/980/981/ 984/986/992/ 995**	**Engine 113.962/982/ 987/988/989/ 990/991/993**
BE01.40-P-1001-02E	Cylinder bore	Peak-to-valley height (R_Z) of top separating surface	mm	0.001 to 0.0045	0.001 to 0.0045
		Wear limit at BDC and TDC of 1st piston ring	mm	< or = 30.03	< or = 0.03

		Permissible deviation of cylinder shape	mm	0.014	0.007
		contact surface peak-to-valley height	µm	-	-

Check values for cylinder bore

Number	Designation			Engine 112.910/ 911	Engine 112.913/920/921/922/ 923/940/941/942/943/ 944/945/949 113.940/941/942/943/945
BE01.40-P-1001-01F	Cylinder dia.	Standard marking X	mm	83.200...83.215	89.900...89.915
		Auxiliary stage Marking	mm	83.250...83.265	83.250 ... 83.265
		Repair size	mm	90.150 ... 90.165	90.150...90.165
BE01.40-P-1002-01F	Cylinder dia., setting for repair size (+0.25)	Pre-honing	mm	83.200	89.900
		Precision honing	mm	83.380	90.080
		Polishing	mm	83.430	90.130
BE01.40-P-1003-01F	Cylinder dia. according to machining phase	Pre-honing	mm	83.380	90.080
		Precision honing	mm	83.430	90.130
		Polishing	mm	90.150 ... 90.165	90.150...90.165
BE01.40-P-1004-01F	Cylinder length		mm	129.5	129.5
BE01.40-P-1005-01F	Undercut		mm	12	12
BE01.40-P-1006-01F	Stroke setting with 70 mm stone length on 70th stroke scale of machine		mm	130	130
BE01.40-P-1007-01F	Stone overrun at top and bottom		mm	9.5	9.5
BE01.40-P-1008-01F	Engine speed	Pre-honing	rpm	125	125
		Precision honing	rpm	125	125
		Polishing	rpm	125	125
		Lapping	rpm	230	230
BE01.40-P-1009-01F	Feed	Pre-honing		4	4
		Precision honing		3	3

		Polishing		2	2
		Lapping		1	1
BE01.40-P-1010-01F	Stroke	Pre-honing	rpm	57	57
		Precision honing	rpm	57	57
		Polishing	rpm	57	57
		Lapping	rpm	80	80
BE01.40-P-1011-01F	Display	Pre-honing	%	20 to 30	20 to 30
		Precision honing	%	20 to 30	20 to 30
		Polishing	%	20 to 30	20 to 30
		Lapping	%	20 to 30	20 to 30
BE01.40-P-1012-01F	Stroke setting with 70 mm felt length on 70th stroke scale of machine		mm	115	115
BE01.40-P-1013-01F	Felt insert overrun at top and bottom		mm	2 to 4	2 to 4
BE01.40-P-1014-01F	Operating time of honing machine		S	40	40

Check values for cylinder bore

Number	Designation			Engine 112.951/961	Engine 112.970
BE01.40-P-1001-01F	Cylinder dia.	Standard marking X	mm	89.900...89.915	97.000 to 97.015
		Auxiliary stage Marking	mm	89.950 to 89.965	97.050 to 97.065
		Repair size	mm	90.150...90.165	97.250 to 90.165
BE01.40-P-1002-01F	Cylinder dia., setting for repair size (+0.25)	Pre-honing	mm	-	97.000
		Precision honing	mm	-	97.180
		Polishing	mm	-	97.230
BE01.40-P-1003-01F	Cylinder dia. according to machining phase	Pre-honing	mm	-	97.180
		Precision honing	mm	-	97.230
		Polishing	mm	-	97.250 ... 97.265
BE01.40-P-1004-01F	Cylinder length		mm	-	130.90 to 131.00
BE01.40-P-1005-01F	Undercut		mm	-	0.6...1.0
BE01.40-P-1006-01F	Stroke setting with 70 mm stone length on 70th stroke scale of machine		mm	-	132
BE01.40-P-1007-01F	Stone overrun at top and bottom		mm	-	9.5

BE01.40-P-1008-01F	Engine speed	Pre-honing	rpm	-	125
		Precision honing	rpm	-	125
		Polishing	rpm	-	125
		Lapping	rpm	-	230
BE01.40-P-1009-01F	Feed	Pre-honing		-	4
		Precision honing		-	3
		Polishing		-	2
		Lapping		-	1
BE01.40-P-1010-01F	Stroke	Pre-honing	rpm	-	57
		Precision honing	rpm	-	57
		Polishing	rpm	-	57
		Lapping	rpm	-	80
BE01.40-P-1011-01F	Display	Pre-honing	%	-	20 to 30
		Precision honing	%	-	20 to 30
		Polishing	%	-	20 to 30
		Lapping	%	-	20 to 30
BE01.40-P-1012-01F	Stroke setting with 70 mm felt length on 70th stroke scale of machine		mm	-	115
BE01.40-P-1013-01F	Felt insert overrun at top and bottom		mm	-	2 to 4
BE01.40-P-1014-01F	Operating time of honing machine		S	-	70

Check values for cylinder bore

Number	Designation			Engine 112.946/947/ 948/960	Engine 112.912
BE01.40-P-1001-01F	Cylinder dia.	Standard marking X	mm	89.900...89.915	83.200...83.215
		Auxiliary stage marking	mm	89.950 to 83.265	83.250...83.265
		Repair size	mm	90.150...90.165	83.450 to 83.465
BE01.40-P-1002-01F	Cylinder dia., setting for repair size (+0.25)	Pre-honing	mm	89.900	83.200
		Precision honing	mm	90.080	83.380
		Polishing	mm	90.130	83.430
BE01.40-P-1003-01F	Cylinder dia. according to machining phase	Pre-honing	mm	90.080	83.380
		Precision honing	mm	90.130	83.430
		Polishing	mm	90.150...90.165	83.450 to 83.465
BE01.40-P-1004-01F	Cylinder length		mm	129.5	129.5
BE01.40-P-	Undercut		mm	12	12

1005-01F					
BE01.40-P-1006-01F	Stroke setting with 70 mm stone length on 70th stroke scale of machine		mm	130	130
BE01.40-P-1007-01F	Stone overrun at top and bottom		mm	9.5	9.5
BE01.40-P-1008-01F	Engine speed	Pre-honing	rpm	125	125
		Precision honing	rpm	125	125
		Polishing	rpm	125	125
		Lapping	rpm	230	230
BE01.40-P-1009-01F	Feed	Pre-honing		4	4
		Precision honing		3	3
		Polishing		2	2
		Lapping		1	1.
BE01.40-P-1010-01F	Stroke	Pre-honing	rpm	57	57
		Precision honing	rpm	57	57
		Polishing	rpm	57	57
		Lapping	rpm	80	80
BE01.40-P-1011-01F	Display	Pre-honing	%	20 to 30	20 to 30
		Precision honing	%	20 to 30	20 to 30
		Polishing	%	20 to 30	20 to 30
		Lapping	%	20 to 30	20 to 30
BE01.40-P-1012-01F	Stroke setting with 70 mm felt length on 70th stroke scale of machine		mm	115	115
BE01.40-P-1013-01F	Felt insert overrun at top and bottom		mm	2 to 4	2 to 4
BE01.40-P-1014-01F	Operating time of honing machine		S	40	40

Check values for cylinder bore

Number	Designation			Engine 113.960/961/ 962/963/964/ 965/967/968/ 971/980/981/ 982/984/987/ 988/989/990/ 991/992/993/ 995
BE01.40-P-1001-01F	Cylinder dia.	Standard marking X	mm	97.000 to 97.015
		Auxiliary stage Marking	mm	97.050 to 97.065
		Repair size	mm	97.250 to 97.265

BE01.40-P-1002-01F	Cylinder dia., setting for repair size (+0.25)	Pre-honing	mm	97.000
		Precision honing	mm	97.180
		Polishing	mm	97.230
BE01.40-P-1003-01F	Cylinder dia. according to machining phase	Pre-honing	mm	97.180
		Precision honing	mm	97.230
		Polishing	mm	97.250 to 97.265
BE01.40-P-1004-01F	Cylinder length		mm	129.5
BE01.40-P-1005-01F	Undercut		mm	12
BE01.40-P-1006-01F	Stroke setting with 70 mm stone length on 70th stroke scale of machine		mm	130
BE01.40-P-1007-01F	Stone overrun at top and bottom		mm	9.5
BE01.40-P-1008-01F	Engine speed	Pre-honing	rpm	125
		Precision honing	rpm	125
		Polishing	rpm	125
		Lapping	rpm	230
BE01.40-P-1009-01F	Feed	Pre-honing		4
		Precision honing		3
		Polishing		2
		Lapping		1
BE01.40-P-1010-01F	Stroke	Pre-honing	rpm	57
		Precision honing	rpm	57
		Polishing	rpm	57
		Lapping	rpm	80
BE01.40-P-1011-01F	Display	Pre-honing	%	20 to 30
		Precision honing	%	20 to 30
		Polishing	%	20 to 30
		Lapping	%	20 to 30
BE01.40-P-1012-01F	Stroke setting with 70 mm felt length on 70th stroke scale of machine		mm	115
BE01.40-P-1013-01F	Felt insert overrun at top and bottom		mm	2 to 4
BE01.40-P-1014-01F	Operating time of honing machine		S	70

Commercially available tools

Number	Designation
WH58.30-Z-1030-04A	Honing head CK-3000 for 76-127 mm dia. CK-2600, Firma Hommel Prazision GmbH D-50767 Koln Firma Sunnen Products Comp. USA- -7910 Manchester St. Louis, Mo.63143

WH58.30-Z-1031-04A	Pre-honing, stone set C 30-A 53, or C30 J64, 70 mm long, Firma Hommel Prazision GmbH D-50767 Koln Firma Sunnen Products Comp. USA- -7910 Manchester St. Louis, Mo.63143
WH58.30-Z-1032-04A	Precision honing, stone set C 30-J 84, 70 mm long, Firma Hommel Prazision GmbH D-50767 Koln Firma Sunnen Products Comp. USA- -7910 Manchester St. Louis, Mo.63143
WH58.30-Z-1033-04A	Polishing, stone set C 30-C 03-81, 70 mm long, Firma Hommel Prazision GmbH D-50767 Koln Firma Sunnen Products Comp. USA- -7910 Manchester St. Louis, Mo.63143
WH58.30-Z-1034-04A	Stone holder for felt insert CK-30 35, Firma Hommel Prazision GmbH D-50767 Koln Firma Sunnen Products Comp. USA- -7910 Manchester St. Louis, Mo.63143
WH58.30-Z-1035-04A	Felt insert holder set CK3130, Firma Hommel Prazision GmbH D-50767 Koln Firma Sunnen Products Comp. USA- -7910 Manchester St. Louis, Mo.63143
WH58.30-Z-1036-04A	Felt insert C 30-F 85, Firma Hommel Prazision GmbH D-50767 Koln Firma Sunnen Products Comp. USA- -7910 Manchester St. Louis, Mo.63143

Workshop equipment

WE58.40-Z-1002-21A	Automatic cylinder repair machine
WE58.40-Z-1003-21A	Internal measuring device (50... 150 mm dia., with 0.01 mm display and measuring point for pressure relief)
WE58.40-Z-1004-21A	Adjusting micrometer for internal measuring device (with adjustment range 50-200 mm)

Repair materials

Number	Designation	Order number
BR00.45-Z-1050-06A	Polmot honing paste Order no. 600.11	Polmat - Poliertechnik GmbH Troggberg 11 38302 Wolfenbuttel Germany

MEASURE CYLINDER BORES - AR01.40-P-9202AV

ENGINE 113 in MODELS 129, 163, 202, 203, 208, 209, 210, 211, 215, 220, 230

ENGINES 112 /945, 113.962 /982

1, 2, 3	Measuring points of cylinder bore
A	Longitudinal direction
B	Transverse direction
a	Upper reversal point of 1st piston ring
b	Bottom dead center of piston
c	Bottom reversal point of oil scraper ring

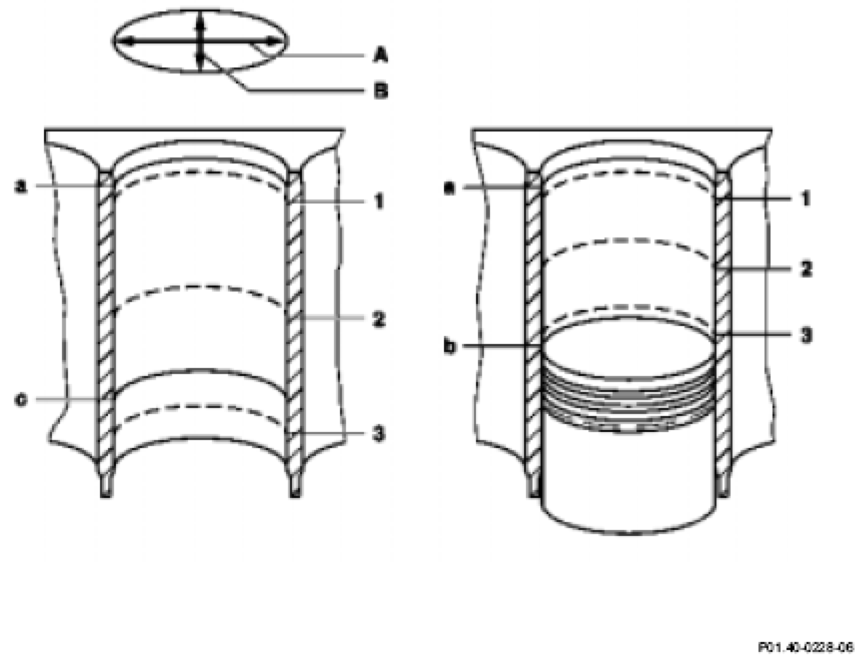


Fig. 101: Identifying Measuring Points Of Cylinder Bore

Figure item, etc.	Work instructions		
[i]	Cylinder bore	Measure diameter of the cleaned cylinder bores with an internal measuring instrument in the longitudinal and transverse directions.	
1,2,3 [i]	Cylinder bore diameter at the measuring points	Measure	**Fig. 102** ***WH58.30-Z-1001-12A** ***WH58.30-Z-1011-12A**
[i]		Cylinder diameter code letter X	***BE01.40-P-1001-01F**
		Cylinder diameter code letter	***BE01.40-P-1001-01F**
		Repair size	***BE01.40-P-1001-01F**

Check values for cylinder bore

		Engines 113.960/961/ 962/963/964/

Number	Designation			965/967/968/ 971/980/981/ 982/984/987/ 988/989/990/ 991/992/993/ 995
BE01.40-P-1001-01F	Cylinder dia.	Standard Marking X	mm	97.000 to 97.015
		Auxiliary stage Marking	mm	97.050 to 97.065
		Repair size	mm	97.250 to 97.265

Check values for cylinder bore

Number	Designation			Engine 112.910/ 911	Engines 112.913/920/921/922/ 923/940/941/942/943/ 944/945/949 113.940/941/942/943/ 945
BE01.40-P-1001-01F	Cylinder dia.	Standard Marking X	mm	83.200...83.215	89.900...89.915
		Auxiliary stage Marking	mm	83.250...83.265	89.950 to 83.265
		Repair size	mm	83.450 to 83.465	90.150...90.165

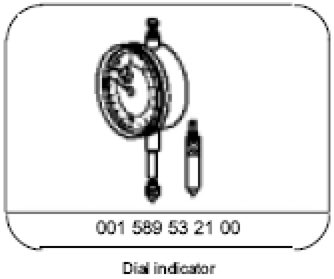


Fig. 102: Identifying Dial Indicator (001 589 53 21 00)

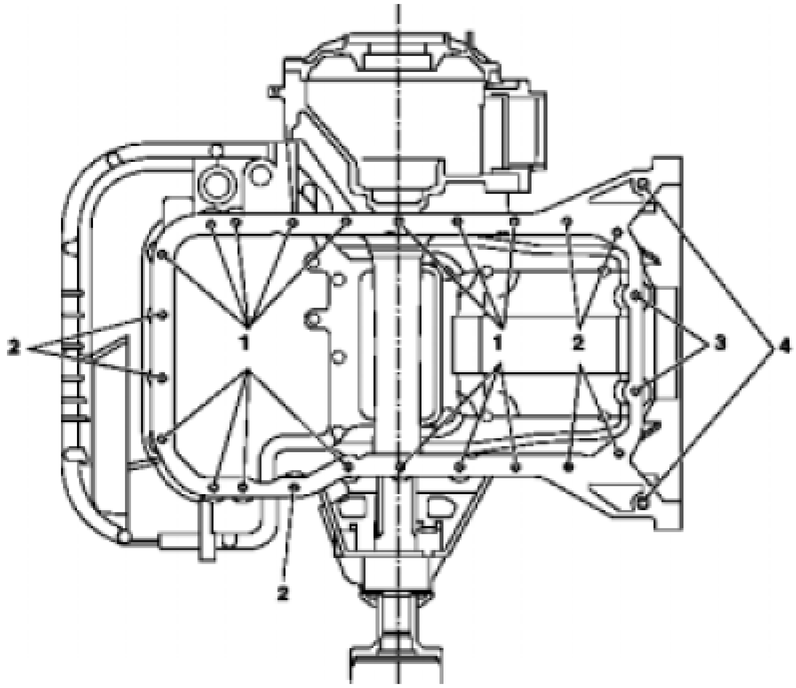
Commercially available tools

Number	Designation
WH58.30-Z-1001-12A	Quick calipers for internal measurements
WH58.30-Z-1011-12A	Internal measuring instrument

OIL PAN BOLT DIAGRAM - AR01.45-P-7500-06F

Upper part of oil pan shown on engine 112 with 4 MATIC

1 Bolt M6 × 20
2 Bolt M6 × 40
3 Bolt M6 × 85
4 Bolt M8 × 30

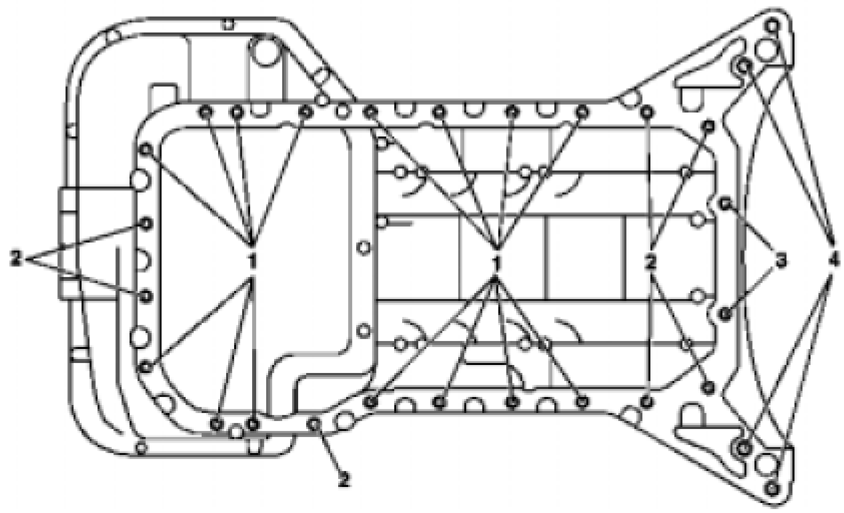


P01.45-0233-06

Fig. 103: Identifying Oil Pan Bolt Diagram - Upper Part Of Oil Pan Shown On Engine 112 With 4 Matic

Upper part of oil pan shown on engine 112 without 4 MATIC

1 Bolt M6 × 20
2 Bolt M6 × 40
3 Bolt M6 × 90
4 Bolt M8 × 30



P01.45-0236-05

Fig. 104: Identifying Oil Pan Bolt Diagram - Upper Part Of Oil Pan Shown On Engine 112 Without 4 Matic

Upper part of oil pan shown on engine 113

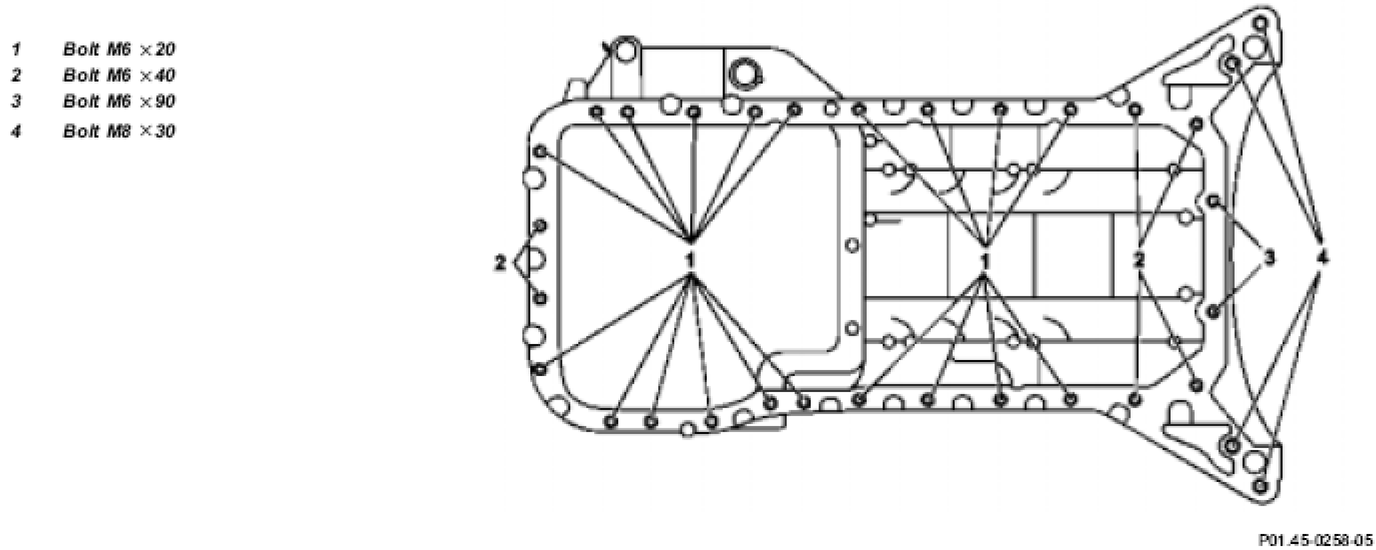


Fig. 105: Identifying Oil Pan Bolt Diagram - Upper Part Of Oil Pan Shown On Engine 113

REMOVE/INSTALL OIL PAN - AR01.45-P-7500FB

ENGINE 112.942 in MODEL 163.154

ENGINE 112.970 in MODEL 163.157

ENGINE 113.942 in MODEL 163.172

ENGINE 113.981 in MODEL 163.174

ENGINE 113.965 in MODEL 163.175

Shown on engine 112

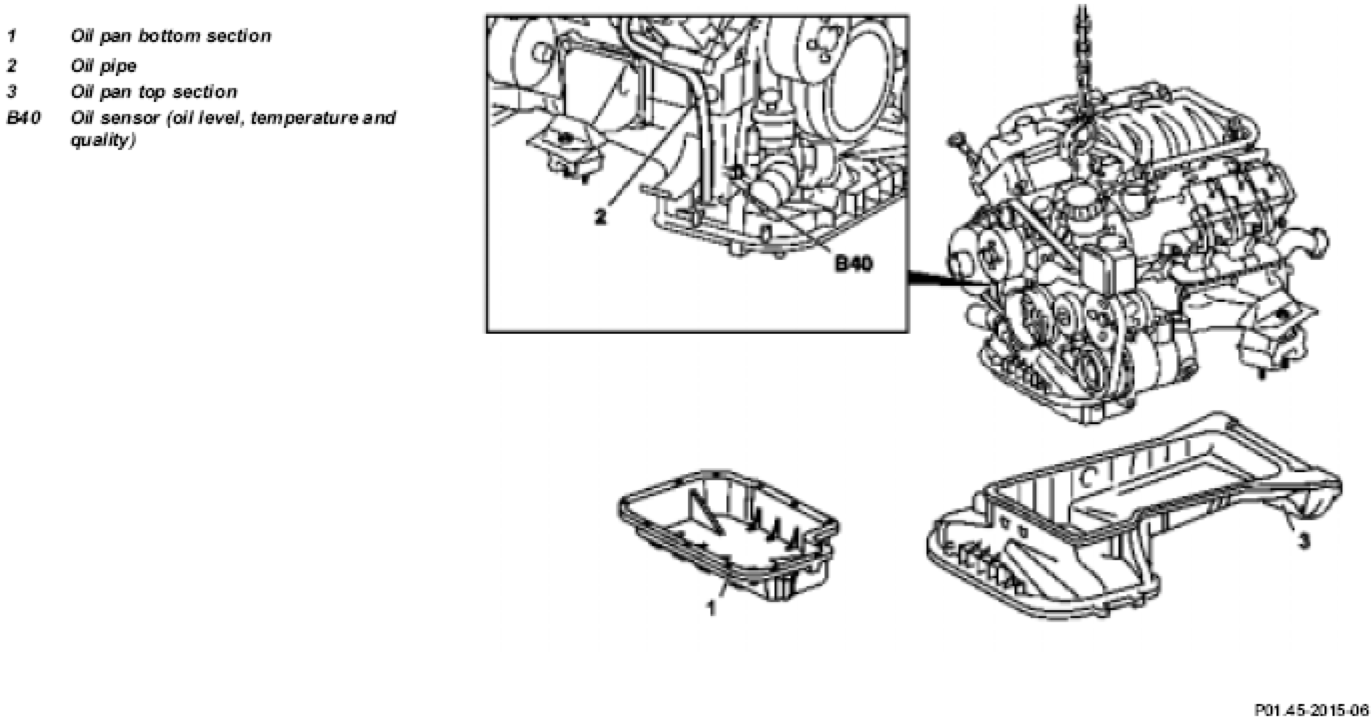


Fig. 106: Identifying Oil Pan Remove/Install Components - Shown On Engine 112

	Remove/install		
i		External torx set	**Fig. 49**
1	Remove oil pan bottom section (1)	Model 163.154/157/172. Model 163.174/175. Danger!	**AR01.45-P-7555V** **AR01.45-P-7555VE** ***BA01.45-P-1002-01B**
2	Disconnect electrical line at oil sensor (oil level, temperature and quality) (B40)	i Remove cable strap at oil pipe.	
3	Remove oil pipe (2) from dipstick	i **Installation:** Replace the sealing ring! Danger!	**AR18.40-P-3510BV** ***BA01.20-P-1001-01E**
4	Remove oil pan top section(3)	Take out oil pan to the front in direction of travel for this step; rotate crankshaft slightly, if necessary. i **Installation:** Observe different bolt length and bolt diameter: ? Screw diagram of oil pan	 **AR01.45-P-7500-06F**
i	Notes on application of sealant to oil pan	Engine 112	**AH01.45-P-0001-01C**

i	Notes on application of sealant to oil pan	Engine 113.941/942/960/962/965/981. ⚠ Danger!	**AH01.45-P-0001-01E** ***BA01.45-P-1001-01B** ***BR00.45-Z-1013-01A**
5	Install in the reverse order		
6	Read out fault memory and erase	Stored faults which can result from cables being disconnected or from simulation during removal and installation or test work, have to be processed and erased in the fault memories after completing the work: ? Diagnosis Manual Volume 2 Index 0: Connecting and using test equipment.	
⚠ Danger!	**Risk of accident** caused by vehicle starting off by itself when engine is running. **Risk of injury** caused by contusions and burns during starting procedure or when working near the running engine	Secure vehicle to prevent it from moving by itself. Wear closed and snug-fitting work clothes. Do not grasp hot or rotating parts.	**AS00.00-Z-0005-01A**
7	Run engine and inspect for leaks		

⚠ Danger! **Crankcase ventilation, cylinder head cover**

Number	**Designation**		**Engine 112.910/911/912/913/914/915/916/917/920/921/922/923/940/941/942/943/944/945/946/947/949/951/953/954/955/960/961/970/972/973/975/976**	**Engine 113.940/941/942/943/944/948/960/961/962/963/964/965/966/967/968/969/971/980/981/982/984/986/992/995**	**Engine 113.987/988/990/991/993**
BA01.20-P-1001-01E	Screw of cylinder head cover	Nm	8	10	8

BA01.20-P-1002-01E	Bolt of ignition coils to cylinder head cover		Nm	8	8	8

⚠ Danger! **Oil pan**

Number	Designation			Engine 112.910/911/912/913/914/915/917/920/921/922/923/940/941/942/943/944/945/946/947/949/951/954/955/960/961/970/972/973/976	Engine 113.940/941/942/943/944/945/946/960/961/962/963/965/967/968/969/980/981/982/984/986/992/995
BA01.45-P-1001-01B	Bolt, oil pan to crankcase	M6	Nm	9	9
		M8	Nm	20	20
BA01.45-P-1002-01B	Self-tapping screw of oil pan to oil pan	Thread not pre-tapped	Nm	14	14
		Thread pre-tapped	Nm	10	10

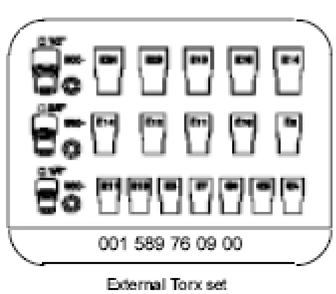


Fig. 107: Identifying External Torx Set (001 589 76 09 00)

Repair materials

Number	Designation	Order number
BR00.45-Z-1013-01A	Sealant	A 003 989 98 20

REMOVE/INSTALL BOTTOM PART OF OIL PAN - AR01.45-P-7555V

ENGINE 112.942 in MODEL 163.154

ENGINE 112.970 in MODEL 163.157

ENGINE 113.942 in MODEL 163.172

Shown on engine 112

1	Air filter housing
2	Resonance unit
3	Resonance tube
4	Viscous fan
5	Fan shroud
6	Oil pan bottom section
7	Nuts
8	Bolts
9	Air baffle
W11/5	Engine/bodywork ground strap

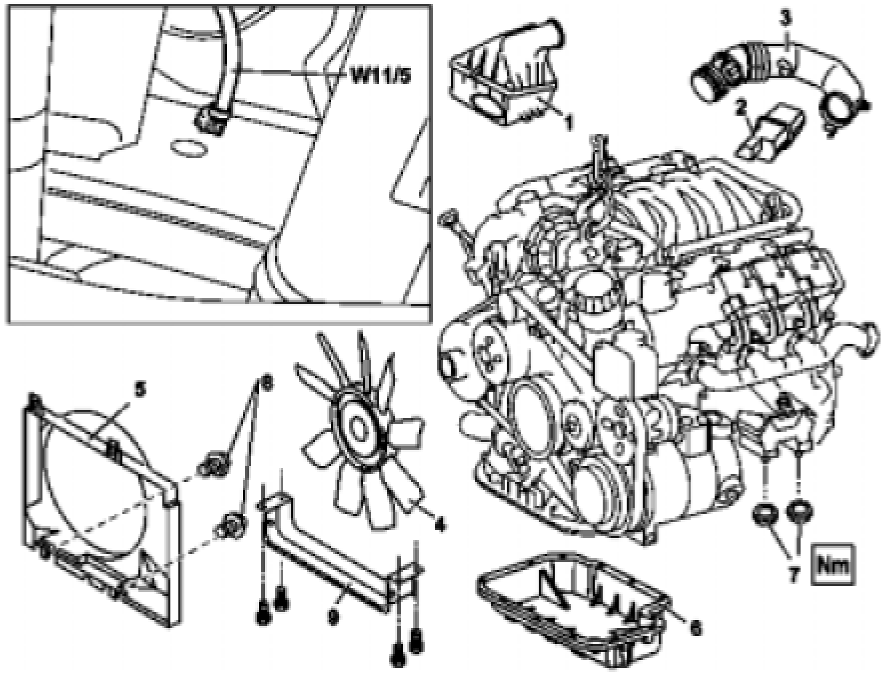


Fig. 108: Identifying Bottom Part Of Oil Pan Remove/Install Components - Shown On Engine 112

	Remove/install		
i		External torx set	Fig. 49
1	Remove engine trim panel		
2	Remove viscous fan (4)	i Right-hand thread!	AR20.40-P-5660C
3.1	Remove fan shroud (5)	i Only engine 112.942 /970. i Unscrew bolts (8) at bottom of fan shroud.	
4.1	Remove air guide (9)	i Engine 113.942 only.	
5	Drain and collect engine oil	Danger!	*BA01.45-P-1003-01B *BF18.00-P-1001-01H
6	Unscrew nuts (7) at front suspension carrier	i Before unbolting the left engine mount, press oil line of power steering out of fixture. Danger!	*BA22.10-P-1001-01L
7	Remove resonance tube (3) with resonance unit (2)	i Do not damage the plastic strap. i The resonance pipe is attached at the rear at the	

		intake manifold with a plastic plate. i Separate connector of hot film MAF sensor (HFM) and unscrew resonance tube at cylinder head cover.	
		Engine 112.942/970.	**AR07.07-P-1454A**
		Engine 113.942/965.	**AR07.07-P-1454MV**
8	Put on engine support bracket		**AR33.10-P-0100-01BV**
		i Engine lifting device for ML-class	***WE58.40-Z-1007-11A**
9	Raise engine	i Ensure that the rear of the engine does not touch the body! Do not overstretch coolant lines and engine/ bodywork ground strap (W11/5), detach engine/ bodywork ground strap (W11/5) if required.	
10	Unbolt bottom part of oil pan (6)	⚠ Danger!	***BA01.45-P-1002-01B**
11	Remove oil pan bottom section (6)	i **Installation:** Clean sealing surfaces, apply sealant to the sealing surfaces with a bead of 2.0 mm (± 0.5 mm)! The sealant must be applied within 10 minutes! The silicone bead must not be spread!	***BR00.45-Z-1013-01A**
i	Notes on application of sealant to oil pan	Engine 112.	**AH01.45-P-0001-01C**
		Engine 113.942/965.	**AH01.45-P-0001-01E**
12	Install in the reverse order		

⚠ Danger! **Oil pan**

		Engines 112.910/911/ 912/913/914/ 915/917/920/ 921/922/923/ 940/941/942/ 943/944/945/ 946/947/949/	**Engines 113.940/941/ 942/943/944/ 945/946/960/ 961/962/963/ 965/967/968/**

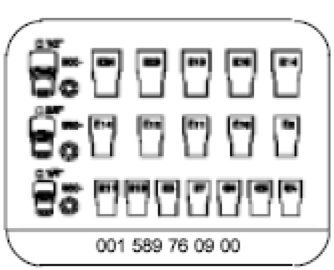
Number	Designation			951/954/955/ 960/961/970/ 972/973/976	969/980/981/ 982/984/986/ 992/995
BA01.45-P-1002-01B	Self-tapping screw of oil pan to oil pan	Thread not pretapped	Nm	14	14
		Thread pre-tapped	Nm	10	10
BA01.45-P-1003-01B	Oil drain screw to oil pan	M14	Nm	30	30

Danger! Engine mounts, engine supports

Number	Designation		Engine 112.942/970 113.942/965/981 in model 163.154/157/172/174/175
BA22.10-P-1001-01L	Bolt, front engine mounts to front axle carrier	Nm	35

Engine lubrication

Number	Designation			Engine 112 except 112.916/953/975	Engines 113.940/941/ 942/943/960/ 961/962/969/ 982
BF18.00-P-1001-01H	Engine oil	Filling capacity with oil filter	Liters	8.0	8.0
		Filling capacity without oil filter	Liters	7.5	-
		Specifications for Operating Fluids	Sheet	**BB00.40-P-0229-01A**	**BB00.40-P-0229-01A**
			Sheet	**BB00.40-P-0229-03A**	**BB00.40-P-0229-03A**
			Sheet	**BB00.40-P-0229-05A**	**BB00.40-P-0229-05A**



External Torx set

Fig. 109: Identifying External Torx Set (001 589 76 09 00)

Workshop equipment

WE58.40-Z-1007-11A	Engine lifting fixture

Repair materials

Number	Designation	Order number
BR00.45-Z-1013-01A	Sealant	A 003 989 98 20

REMOVE/INSTALL BOTTOM PART OF OIL PAN - AR01.45-P-7555VE

ENGINE 113.965 in MODEL 1

ENGINE 113.981 in MODEL 1

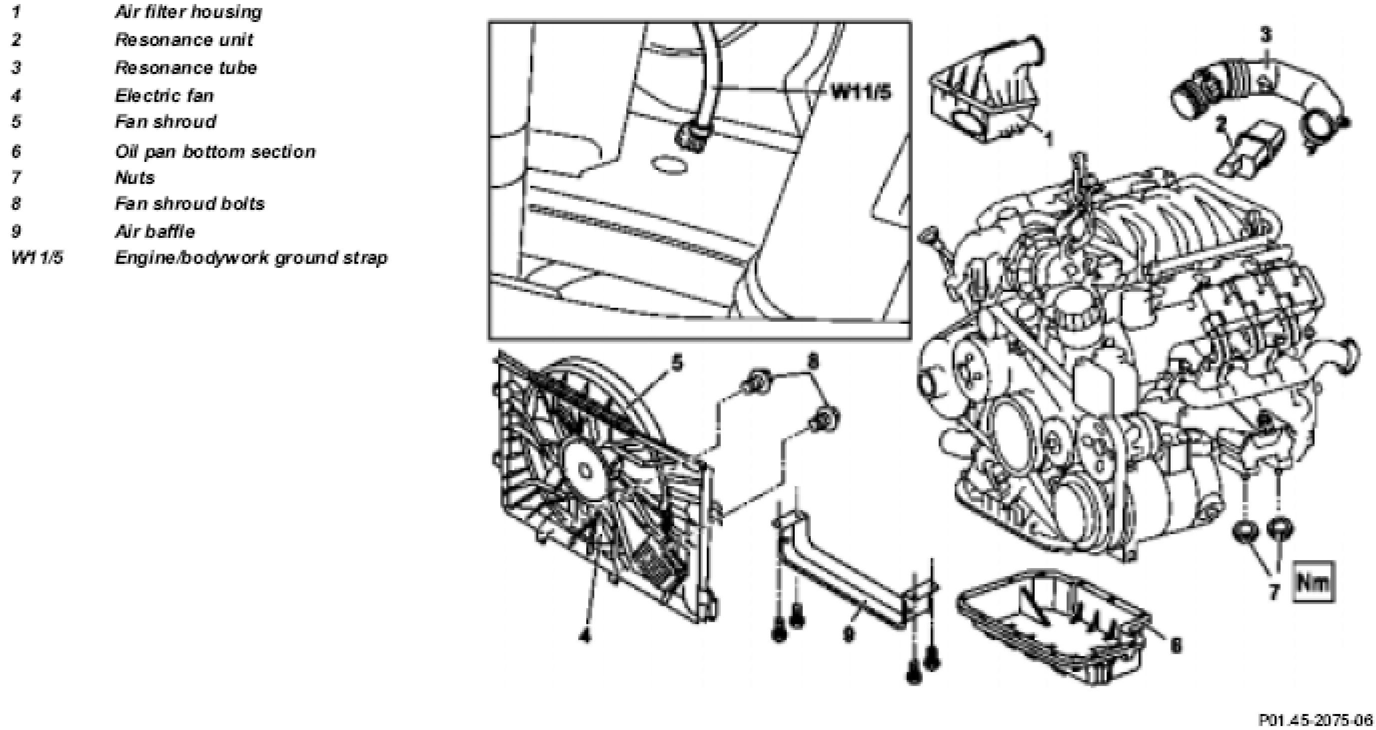


Fig. 110: Identifying Bottom Part Of Oil Pan Remove/Install Components

	Remove/install		
i		External torx set	**Fig. 49**
1	Remove engine trim panel		
2	Drain and collect engine oil	Danger!	***BA01.45-P-1003-01B** *BF18.00-P-1001-01H**
3	Unscrew nuts (7) at front suspension carrier	i Before unscrewing the	

		left engine mount, press oil line of power steering from bracket. ⚠ Danger!	***BA22.10-P-1001-01L**
4	Remove resonance tube (3) with resonance unit (2)	[i] Do not damage the plastic strap. [i] Separate plug connection of hot film mass air flow sensor (HFM) for this step and unbolt resonance pipe at cylinder head cover. The resonance pipe is attached to the rear of the intake manifold with a plastic bracket.	**AR07.07-P-1454MV**
5	Put on engine support bracket	[i] Engine lifting device for ML-class	**AR33.10-P-0100-01BV** ***WE58.40-Z-1007-11A**
6	Raise engine	[i] Ensure that the rear of the engine does not touch the body! Do not overstretch coolant lines and engine/bodywork ground strap (W11/5), detach engine/bodywork ground strap (W11/5) if required.	
7	Remove oil pan bottom section (6)	[i] **Installation:** Clean sealing surfaces, apply sealant to the sealing surfaces with a bead of 2.0 mm ± 0.5 mm! The sealant must be applied within 10 minutes! The silicone bead must not be spread!	***BR00.45-Z-1013-01A**
[i]	Notes on application of sealant to oil pan	⚠ Danger!	**AH01.45-P-0001-01E** ***BA01.45-P-1002-01B**
8	Install in the reverse order		

⚠ Danger! **Oil pan**

		Engines 113.940/941/ 942/943/944/ 945/946/960/ 961/962/963/

Number	Designation				965/967/968/ 969/980/981/ 982/984/986/ 992/995
BA01.45-P-1002-01B	Self-tapping screw of oil pan to oil pan	Thread not pre-tapped		Nm	14
		Thread pre-tapped		Nm	10
BA01.45-P-1003-01B	Oil drain screw to oil pan	M14		Nm	30

Danger! **Engine mounts, engine supports**

Number	Designation		Engine 112.942/970 113.942/965/981 in model 163.154/157/17 2/174/17 5
BA22.10-P-1001-01L	Bolt, front engine mounts to front axle carrier	Nm	35

Engine lubrication

Number	Designation				Engine 113.944/980/981 /984/986/991	Engine 113.963/ 963/965
BF18.00-P-1001-01H	Engine oil	Filling capacity with oil filter		Liters	7.5	7.5
		Filling capacity without oil filter		Liters	-	7.0
		Specifications for Operating Fluids		Sheet	**BB00.40-P-0229-01A**	**BB00.40-P-0229-01A**
				Sheet	**BB00.40-P-0229-03A**	**BB00.40-P-0229-03A**
				Sheet	**BB00.40-P-0229-05A**	**BB00.40-P-0229-05A**

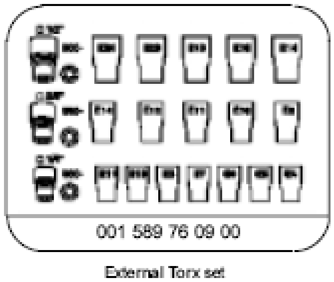


Fig. 111: Identifying External Torx Set (001 589 76 09 00)

Workshop equipment

WE58.40-Z-1007-11A	Engine lifting fixture

Repair materials

Number	Designation	Order number
BR00.45-Z-1013-01A	Sealant	A 003 989 98 20

TEST & ADJUSTMENT VALUES

CYLINDER HEAD/CYLINDER HEAD BOLTS - BE01.30-P-1000-04B

Engines 103, 104, 111, 112, 113, 119, 120, 137, 155, 156, 271, 272, 273, 275, 285

Cylinder head/cylinder head bolts

Number	Designation			Engine 103	Engine 104
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	12	12
		Length (L) when new	mm	105	160
		Length (L)	mm	< or = 108.4	< or = 162.7
		See picture		-	-
BE01.30-P-1002-04B	Cylinder head	Overall height "H" mm	mm	89.9 to 90.0	135.9 to 136.0
		Height	mm	> or = 89.5	> or = 135.5
		See picture		-	-
BE01.30-P-1003-04B	Cylinder head	permissible difference of flatness of contact surface in longitudinal direction	mm	-	-
		permissible difference of flatness of contact surface in transverse direction	mm	-	-
		Peak-to-valley height	µM	-	-
BE01.30-P-1004-04B	Cylinder head when new	Reference dimension "H1"	mm	-	-
		Reference dimension "H2"	mm	-	-
BE01.30-P-1005-04B	Cylinder head after necessary	Reference dimension "H1"	mm	-	-

	stock removal	Reference dimension "H2"	mm	-	-

Cylinder head/cylinder head bolts

Number	Designation			Engine 111	Engine 112.910/911/912/913/914/915/916/917/920/921/922/923/940/941/942/943/944/945/946/947/949/951/953/954/955/960/961/970/972/973/975/976
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	12	11
		Length (L) when new	mm	102	141.5
		Length (L)	mm	< or = 105	< or = 144.5
		See picture		AR01.30-P-5800-03HA	**AR01.30-P-5800-03B**
BE01.30-P-1002-04B	Cylinder head	Overall height "H" mm	mm	135.9 to 136.0	106.2 to 106.3
		Height	mm	> or = 135.5	-
		See picture		AR01.30-P-7162A	-
BE01.30-P-1003-04B	Cylinder head	permissible difference of flatness of contact surface in longitudinal direction	mm	0.08	0.1
		permissible difference of flatness of contact surface in transverse direction	mm	0	0.1
		Peak-to-valley height	µM	3/10	10
BE01.30-P-1004-04B	Cylinder head when new	Reference dimension "H1"	mm	-	-
		Reference dimension "H2"	mm	-	-

BE01.30-P-1005-04B	Cylinder head after necessary stock removal	Reference dimension "H1"	mm	-	-
		Reference dimension "H2"	mm	-	-

Cylinder head/cylinder head bolts

Number	Designation			Engines 113.940/941/942/943/944/945/946/948/960/961/962/963/964/965/966/967/968/969/971/980/981/982/984/986/987/988/990/991/992/993/995	Engine 113.989
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	11	11
		Length (L) when new	mm	141.5	141.5
		Length (L)	mm	< or = 144.5	< or = 144.5
		See picture		**AR01.30-P-5800-03B**	**AR01.30-P-5800-03B**
BE01.30-P-1002-04B	Cylinder head	Overall height "H" mm	mm	-	-
		Height	mm	-	-
		See picture		-	-
BE01.30-P-1003-04B	Cylinder head	permissible difference of flatness of contact surface in longitudinal direction	mm	-	-
		permissible difference of flatness of contact surface in transverse direction	mm	-	-
		Peak-to-valley height	µM	-	-
BE01.30-P-1004-04B	Cylinder head when new	Reference dimension "H1"	mm	-	-
		Reference	mm	-	-

		dimension "H2"			
BE01.30-P-1005-04B	Cylinder head after necessary stock removal	Reference dimension "H1"	mm	-	-
		Reference dimension "H2"	mm	-	-

Cylinder head/cylinder head bolts

Number	Designation			Engine 119	Engine 120
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	12	12
		Length (L) when new	mm	160	168
		Length (L)	mm	< or = 162.7	< or = 171
		See picture		-	-
BE01.30-P-1002-04B	Cylinder head	Overall height "H" mm	mm	-	135.9 to 136.0
		Height	mm	-	> or = 135.5
		See picture		-	-
BE01.30-P-1003-04B	Cylinder head	permissible difference of flatness of contact surface in longitudinal direction	mm	-	-
		permissible difference of flatness of contact surface in transverse direction	mm	-	-
		Peak-to-valley height	µM	-	-
BE01.30-P-1004-04B	Cylinder head when new	Reference dimension "H1"	mm	130.6 to 130.7	-
		Reference dimension "H2"	mm	145.9 to 146.0	-
BE01.30-P-1005-04B	Cylinder head after necessary stock removal	Reference dimension "H1"	mm	130.0	-
		Reference dimension "H2"	mm	145.3	-

Cylinder head/cylinder head bolts

Number	Designation			Engine 137	Engine 155.980
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	10	11
		Length (L) when	mm	126/162	175 +-0.5

		new			
		Length (L)	mm	< or = 129/165	< or = 176.6
		See picture		AR01.30-P-5800-03L	**AR01.30-P-5800-03B**
BE01.30-P-1002-04B	Cylinder head	Overall height "H" mm	mm	-	114.9...115.1
		Height	mm	-	114.9...115.1
		See picture		-	-
BE01.30-P-1003-04B	Cylinder head	permissible difference of flatness of contact surface in longitudinal direction	mm	0.03	-
		permissible difference of flatness of contact surface in transverse direction	mm	0.03	-
		Peak-to-valley height	µM	10	-
BE01.30-P-1004-04B	Cylinder head when new	Reference dimension "H1"	mm	-	-
		Reference dimension "H2"	mm	-	-
BE01.30-P-1005-04B	Cylinder head after necessary stock removal	Reference dimension "H1"	mm	110.87..110.95	-
		Reference dimension "H2"	mm	-	-

Cylinder head/cylinder head bolts

Number	Designation			Engine 156	Engine 271
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	11	10x1.5
		Length (L) when new;	mm	175	165
		Length (L);	mm	176.2	167.5
		See picture		-	-
BE01.30-P-1002-04B	Cylinder head	Overall height "H" mm	mm	-	114.9...115.1
		Height	mm	-	114.9...115.1
		See picture		-	-
BE01.30-P-1003-04B	Cylinder head	permissible difference of	mm	-	0.07

		flatness of contact surface in longitudinal direction			
		permissible difference of flatness of contact surface in transverse direction	mm	-	0.05
		Peak-to-valley height	µM	-	10
BE01.30-P-1004-04B	Cylinder head when new	Reference dimension "H1"	mm	-	-
		Reference dimension "H2"	mm	-	-
BE01.30-P-1005-04B	Cylinder head after necessary stock removal	Reference dimension "H1"	mm	-	-
		Reference dimension "H2"	mm	-	-

Cylinder head/cylinder head bolts

Number	Designation			Engine 272	Engine 273
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	11	11
		Length (L) when new	mm	170	170
		Length (L)	mm	172	172
		See picture		-	-
BE01.30-P-1002-04B	Cylinder head	Overall height "H" mm	mm	-	-
		Height	mm	-	-
		See picture		-	-
BE01.30-P-1003-04B	Cylinder head	permissible difference of flatness of contact surface in longitudinal direction	mm	-	-
		permissible difference of flatness of contact surface in transverse direction	mm	-	-

		Peak-to-valley height	µM	-	-
BE01.30-P-1004-04B	Cylinder head when new	Reference dimension "H1"	mm	-	-
		Reference dimension "H2"	mm	-	-
BE01.30-P-1005-04B	Cylinder head after necessary stock removal	Reference dimension "H1"	mm	-	-
		Reference dimension "H2"	mm	-	-

Cylinder head/cylinder head bolts

Number	Designation			Engines 275, 285
BE01.30-P-1001-04B	Cylinder head bolt	Thread diameter	M	10
		Length (L) when new	mm	132/1685
		Length (L)	mm	< or = 133.5/170
		See picture		-
BE01.30-P-1002-04B	Cylinder head	Overall height "H" mm	mm	-
		Height	mm	-
		See picture		-
BE01.30-P-1003-04B	Cylinder head	permissible difference of flatness of contact surface in longitudinal direction	mm	0.03
		permissible difference of flatness of contact surface in transverse direction	mm	0.03
		Peak-to-valley height	µM	10
BE01.30-P-1004-04B	Cylinder head when new	Reference dimension "H1"	mm	-
		Reference dimension "H2"	mm	-
BE01.30-P-1005-04B	Cylinder head after necessary stock removal	Reference dimension "H1"	mm	110.87... 110.95
		Reference dimension "H2"	mm	-

CHECK VALUES FOR CYLINDER BORE - BE01.40-P-1000-01F

ENGINES 112, 113, 155

Check values for cylinder bore

Number	Designation			Engines 112.910/911	Engine 112.912
BE01.40-P-1001-01F	Cylinder dia.	Standard Marking X	mm	83.200...83.215	83.200...83.215
		Auxiliary stage Marking	mm	83.250...83.265	83.250...83.265
		Repair size	mm	83.450 to 83.465	83.450 to 83.465
BE01.40-P-1002-01F	Cylinder diameter setting for repair size (+0.25)	Pre-honing	mm	83.200	83.200
		Precision honing	mm	83.380	83.380
		Polishing	mm	83.430	83.430
BE01.40-P-1003-01F	Cylinder dia. according to machining phase	Pre-honing	mm	83.380	83.380
		Precision honing	mm	83.430	83.430
		Polishing	mm	83.450 to 83.465	83.450 to 83.465
BE01.40-P-1004-01F	Cylinder length		mm	129.5	129.5
BE01.40-P-1005-01F	Undercut		mm	12	12
BE01.40-P-1006-01F	Stroke setting with 70 mm stone length on 70th stroke scale of machine		mm	130	130
BE01.40-P-1007-01F	Stone overrun at top and bottom		mm	9.5	9.5
BE01.40-P-1008-01F	Engine speed	Pre-honing	rpm	125	125
		Precision honing	rpm	125	125
		Polishing	rpm	125	125
		Lapping	rpm	230	230
BE01.40-P-1009-01F	Feed	Pre-honing		4	4
		Precision honing		3	3
		Polishing		2	2
		Lapping		1	1.
BE01.40-P-1010-01F	Stroke	Pre-honing	rpm	57	57
		Precision honing	rpm	57	57
		Polishing	rpm	57	57
		Lapping	rpm	80	80
BE01.40-P-1011-01F	Display	Pre-honing	%	20 to 30	20 to 30
		Precision honing	%	20 to 30	20 to 30
		Polishing	%	20 to 30	20 to 30
		Lapping	%	20 to 30	20 to 30
BE01.40-P-1012-01F	Stroke setting with 70 mm felt length on 70th stroke scale of machine		mm	115	115

BE01.40-P-1013-01F	Felt insert overrun at top and bottom		mm	2 to 4	2 to 4
BE01.40-P-1014-01F	Operating time of honing machine		S	40	40

Check values for cylinder bore

Number	Designation		Unit	Engines 112.913/920/921/922/923/940/941/942/943/944/945/949 113.940/941/942/943/945	Engine 112.946/947/948/960
BE01.40-P-1001-01F	Cylinder dia.	Standard Marking X	mm	89.900...89.915	89.900...89.915
		Auxiliary stage Marking	mm	89.950 to 89.965	89.950 to 89.965
		Repair size	mm	90.150...90.165	90.150...90.165
BE01.40-P-1002-01F	Cylinder dia., setting for repair size (+0.25)	Pre-honing	mm	89.900	89.900
		Precision honing	mm	90.080	90.080
		Polishing	mm	90.130	90.130
BE01.40-P-1003-01F	Cylinder dia. according to machining phase	Pre-honing	mm	90.080	90.080
		Precision honing	mm	90.130	90.130
		Polishing	mm	90.150...90.165	90.150...90.165
BE01.40-P-1004-01F	Cylinder length		mm	129.5	129.5
BE01.40-P-1005-01F	Undercut		mm	12	12
BE01.40-P-1006-01F	Stroke setting with 70 mm stone length on 70th stroke scale of machine		mm	130	130
BE01.40-P-1007-01F	Stone overrun at top and bottom		mm	9.5	9.5
BE01.40-P-1008-01F	Engine speed	Pre-honing	rpm	125	125
		Precision honing	rpm	125	125
		Polishing	rpm	125	125
		Lapping	rpm	230	230
BE01.40-P-1009-01F	Feed	Pre-honing		4	4
		Precision honing		3	3
		Polishing		2	2
		Lapping		1	1

BE01.40-P-1010-01F	Stroke	Pre-honing	rpm	57	57
		Precision honing	rpm	57	57
		Polishing	rpm	57	57
		Lapping	rpm	80	80
BE01.40-P-1011-01F	Display	Pre-honing	%	20 to 30	20 to 30
		Precision honing	%	20 to 30	20 to 30
		Polishing	%	20 to 30	20 to 30
		Lapping	%	20 to 30	20 to 30
BE01.40-P-1012-01F	Stroke setting with 70 mm felt length on 70th stroke scale of machine		mm	115	115
BE01.40-P-1013-01F	Felt insert overrun at top and bottom		mm	2 to 4	2 to 4
BE01.40-P-1014-01F	Operating time of honing machine		S	40	40

Check values for cylinder bore

Number	Designation			Engine 112.951/961	Engine 112.970
BE01.40-P-1001-01F	Cylinder dia.	Standard Marking X	mm	89.900...89.915	97.000 to 97.015
		Auxiliary stage Marking	mm	89.950 to 89.965	97.050 to 97.065
		Repair size	mm	90.150...90.165	97.250 to 90.165
BE01.40-P-1002-01F	Cylinder dia., setting for repair size (+0.25)	Pre-honing	mm	-	97.000
		Precision honing	mm	-	97.180
		Polishing	mm	-	97.230
BE01.40-P-1003-01F	Cylinder dia. according to machining phase	Pre-honing	mm	-	97.180
		Precision honing	mm	-	97.230
		Polishing	mm	-	97.250 to 97.265
BE01.40-P-1004-01F	Cylinder length		mm	-	130.90 to 131.00
BE01.40-P-1005-01F	Undercut		mm	-	0.6...1.0
BE01.40-P-1006-01F	Stroke setting with 70 mm stone length on 70th stroke scale of machine		mm	-	132
BE01.40-P-1007-01F	Stone overrun at top and bottom		mm	-	9.5
BE01.40-P-1008-01F	Engine speed	Pre-honing	rpm	-	125
		Precision honing	rpm	-	125

		Polishing	rpm	-	125
		Lapping	rpm	-	230
BE01.40-P-1009-01F	Feed	Pre-honing		-	4
		Precision honing		-	3
		Polishing		-	2
		Lapping		-	1
BE01.40-P-1010-01F	Stroke	Pre-honing	rpm	-	57
		Precision honing	rpm	-	57
		Polishing	rpm	-	57
		Lapping	rpm	-	80
BE01.40-P-1011-01F	Display	Pre-honing	%	-	20 to 30
		Precision honing	%	-	20 to 30
		Polishing	%	-	20 to 30
		Lapping	%	-	20 to 30
BE01.40-P-1012-01F	Stroke setting with 70 mm felt length on 70th stroke scale of machine		mm	-	115
BE01.40-P-1013-01F	Felt insert overrun at top and bottom		mm	-	2 to 4
BE01.40-P-1014-01F	Operating time of honing machine		S	-	70

Check values for cylinder bore

Number	Designation			Engine 112.976
BE01.40-P-1001-01F	Cylinder dia.	Standard Marking X	mm	97.000 to 97.015
		Auxiliary stage Marking	mm	97.050 to 97.065
		Repair size	mm	97.250 to 97.265
BE01.40-P-1002-01F	Cylinder dia., setting for repair size (+0.25)	Pre-honing	mm	-
		Precision honing	mm	-
		Polishing	mm	-
BE01.40-P-1003-01F	Cylinder dia. according to machining phase	Pre-honing	mm	-
		Precision honing	mm	-
		Polishing	mm	-
BE01.40-P-1004-01F	Cylinder length		mm	-
BE01.40-P-1005-01F	Undercut		mm	-
BE01.40-P-1006-01F	Stroke setting with 70 mm stone length on 70th stroke scale of machine		mm	-
BE01.40-P-1007-01F	Stone overrun at top and bottom		mm	-

BE01.40-P-1008-01F	Engine speed	Pre-honing	rpm	-
		Precision honing	rpm	-
		Polishing	rpm	-
		Lapping	rpm	-
BE01.40-P-1009-01F	Feed	Pre-honing		-
		Precision honing		-
		Polishing		-
		Lapping		-
BE01.40-P-1010-01F	Stroke	Pre-honing	rpm	-
		Precision honing	rpm	-
		Polishing	rpm	-
		Lapping	rpm	-
BE01.40-P-1011-01F	Display	Pre-honing	%	-
		Precision honing	%	-
		Polishing	%	-
		Lapping	%	-
BE01.40-P-1012-01F	Stroke setting with 70 mm felt length on 70th stroke scale of machine		mm	-
BE01.40-P-1013-01F	Felt insert overrun at top and bottom		mm	-
BE01.40-P-1014-01F	Operating time of honing machine		S	-

Check values for cylinder bore

Number	Designation			Engines 113.960/961/962/963/964/965/967/968/971/980/981/982/984/987/988/989/990/991/992/993/995	Engine 155
BE01.40-P-1001-01F	Cylinder dia.	Standard Marking X	mm	97.000 to 97.015	-
		Auxiliary stage Marking	mm	97.050 to 97.065	-
		Repair size	mm	97.250 to 97.265	-
BE01.40-P-1002-01F	Cylinder dia., setting for repair size (+0.25)	Pre-honing	mm	97.000	-
		Precision honing	mm	97.180	-
		Polishing	mm	97.230	-
BE01.40-P-1003-01F	Cylinder dia. according to	Pre-honing	mm	97.180	-
		Precision honing	mm	97.230	-

	machining phase	Polishing	mm	97.250 to 97.265	-
BE01.40-P-1004-01F	Cylinder length		mm	129.5	-
BE01.40-P-1005-01F	Undercut		mm	12	-
BE01.40-P-1006-01F	Stroke setting with 70 mm stone length on 70th stroke scale of machine		mm	130	-
BE01.40-P-1007-01F	Stone overrun at top and bottom		mm	9.5	-
BE01.40-P-1008-01F	Engine speed	Pre-honing	rpm	125	-
		Precision honing	rpm	125	-
		Polishing	rpm	125	-
		Lapping	rpm	230	-
BE01.40-P-1009-01F	Feed	Pre-honing		4	-
		Precision honing		3	-
		Polishing		2	-
		Lapping		1	-
BE01.40-P-1010-01F	Stroke	Pre-honing	rpm	57	-
		Precision honing	rpm	57	-
		Polishing	rpm	57	-
		Lapping	rpm	80	-
BE01.40-P-1011-01F	Display	Pre-honing	%	20 to 30	-
		Precision honing	%	20 to 30	-
		Polishing	%	20 to 30	-
		Lapping	%	20 to 30	-
BE01.40-P-1012-01F	Stroke setting with 70 mm felt length on 70th stroke scale of machine		mm	115	-
BE01.40-P-1013-01F	Felt insert overrun at top and bottom		mm	2 to 4	-
BE01.40-P-1014-01F	Operating time of honing machine		S	70	-

MAINTENANCE

CLEANING AND PRESERVING ENGINE AND ENGINE COMPARTMENT - AP01.00-P-1000ZZ

ENGINE all

1	The engine and engine compartment must be preserved after every cleaning.	Applies for vehicles up to 12/89 and in the period 6/93-7/94	
		The form and materials for masking are to	

2	The fresh air openings, the windshield and the front fenders must be generously masked off before cleaning and preserving.	be determined by each workshop itself. Masking is necessary in order to ensure that no materials whatsoever, e.g. cold cleaning solvent, wax or similar, penetrate inside the car (difficult to clean).	
3	The screw joint holding the brake fluid reservoir must be masked off with adhesive tape, which is to be removed again after preservation of the engine compartment.		
4	Mask off the ventilation hole for the diaphragm chamber in the pressure control valve in the cylinder head cover.	Engines 601, 602, 603	AP01.00-P-8503-01A
5	Cleaning is to be performed when the engine is no hotter than hand-hot (at the exhaust) using a demulsifying cold cleaning solvent (short action time) and a high-pressure hot-water cleaner, depending on how dirty the engine is.	"Demulsifying" means that a mixture of oils and greases in water separated in the oil separator pipe.	
6	When cleaning the component compartment behind the engine compartment: Spray only as much water as necessary under very low pressure.	Electronic control modules must be covered beforehand; any that become wet must be dried afterwards.	
7	After washing/preserving the engine	Lubricate throttle control linkage and check for ease of movement and wear.	
8	Preservation is to be performed only when the engine compartment is dry and using properly functioning commercially available equipment.	Only use approved wax preservation agents. Airless devices produce the least contamination.	
9	Do not spray the following with preservation wax:	Electrical and electronic components, belt drive (belts and pulleys), exhaust pipe and muffler in component compartment.	